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PRINCIPLES OF SURGICAL PRACTICE

RECURRENT DISLOCATION OF THE SHOULDER-JOINT

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OF ALL the joints the shoulder is by far the most commonly dislocated, yet only a very small proportion of these dislocations become truly recurrent. The term "truly recurrent" is used because a clear distinction should be made between the shoulder which is subject to habitual dislocation, that recurs frequently with little and perhaps very trivial provocation, and the shoulder which by an evil chance is dislocated several times by violence, although it recovers without blemish from each successive incident. In the latter case the joint is normal. Each dislocation is precipitated by trauma which would cause dislocation of any shoulder joint. In the former case, the true recurrent or habitual dislocation, there must obviously be some grave defect in the mechanism of the joint, which permits dislocation with almost casual facility.

The defect might be congenital, but this happens only rarely. Occasionally the first dislocation may occur as the result of very little trauma, which fact suggests some pre-existent abnormality of the joint, but as a rule it presents no unusual features. Further, the joint has usually functioned perfectly for many years before the series of recurrent dislocations commences. We must assume therefore that by an initial dislocation some permanent damage is inflicted, as a result of which the joint becomes weakened, so that recurrent dislocations are easily provoked. It is in patients who either voluntarily, or in the course of an epileptic attack, engage in violent muscular activity that this weakness is most likely to be exposed.

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Since the joint is formed of muscles, bones, and capsule it is clear that the flaw must lie in one of these components, and all these possibilities have received considerable attention in the literature.

THE THEORY OF A MUSCULAR DEFECT

Clinical examination does not support the theory that there is any muscular defect. Occasionally there is slight wasting of the deltoid muscle, but as a rule the tone and volume are normal. It has been suggested that shortness of the pectoralis major and latissimus dorsi might cause dislocation by supplying a fulcrum over which the head of the humerus is forced out of the joint by abduction of the arm. Some surgeons have reported success in curing recurrent dislocation by the simple measure of lengthening these muscles (Young). However, there has been no convincing report of a substantial series of cases treated in this way and observed over an adequate period of time; and the victim of recurrent dislocation has a perfect range of active and passive movement—a fact which is incompatible with any muscular contracture.

During anterior dislocation of the shoulder the tendons of the supraspinatus and infraspinatus are, of course, stretched over the glenoid cavity. As a rule the muscles successfully adapt themselves to the abnormal position of the humeral head, but there is a large proportion of cases in which the action of the supraspinatus is affected. In fact, some disturbance of the function of the supraspinatus is the most common complication of dislocation of the shoulder. It is revealed by the familiar supraspinatus syndrome—limitation of active abduction, although passive movements

are not restricted and the deltoid muscle is not paralyzed. As a rule the muscle resumes its normal function in the course of a few weeks or months, and the syndrome disappears. This transient weakness may be due to a bruise or partial rupture of the supraspinatus tendon, or to a fracture of the greater tuberosity involving the facet into which this tendon is inserted. In a small number of cases the tendon is completely ruptured, and, unless an operation is performed to repair the rupture, the supraspinatus syndrome persists, and the shoulder is permanently disabled.

It has been supposed by some that the more serious types of supraspinatus lesion might account for recurrence of the dislocation. Duchenne has stated that recurrent dislocation cannot occur unless the supraspinatus tendon has been ruptured. This is certainly incorrect. Cases of recurrent dislocation do not present the supraspinatus syndrome on clinical examination, and cases of supraspinatus rupture, diagnosed clinically and proved at operation, show no tendency toward dislocation. Further, routine x-ray examination of cases of recurrent dislocation of the shoulder shows no evidence of previous fracture, and it appears from this that avulsion of the upper part of the greater tuberosity of the humerus, which must impede the action of the supraspinatus muscle, does not predispose to recurrence of the dislocation. The supraspinatus tendon, therefore, cannot be indicted.

Apart from lesions of individual muscles, it has been suggested that inco-ordinated or abnormally co-ordinated action of the shoulder muscles as a whole might be responsible for recurrent dislocation. Perhaps a tenuous analogy might be drawn between this idea and the mechanism of pathological dislocation in arthritis. In acute arthritis of the hip joint, for instance, when spasm disturbs the normal balance of muscular activity, the joint is maintained in a position of flexion, adduction, and internal rotation, and pathological dislocation may occur quite suddenly at an early stage of the disease as the result of this abnormal muscular activity. With some such idea in mind, Codman, and Davis after him, have treated recurrent dislocation by exercises intended to develop a muscular control which will prevent dislocation of the shoulder joint.

THE THEORY OF A BONY LESION

The conception of a muscular lesion is not convincing, and at first sight it would seem far more likely that the instability of the joint could be explained by some bony defect. Flatness of the anterior lip of the glenoid and deformities of the head of the humerus have been suggested, and in some cases described, as the responsible lesions. Reich, from post-mortem studies, concludes that fracture or erosion of the anterior margin of the glenoid cavity commonly occurs in dislocated shoulders. Tavernier goes at length into the subject, and nearly all authors mention bony defects, either congenital or acquired as the result of trauma, among the causes of recurrent dislocation. X-ray examination, however, usually reveals no abnormality at all. Henderson, it is true, mentions an occasional appearance of roughness of the articular surfaces on roentgenological examination, but there is nothing at all convincing, and the most apt and destructive comment on this theory of a bony lesion came from Broca, who said that "encochée ou non, il faut que la tête trouve une cavité où se loger lorsqu'elle se reluxe."

This "cavité" is the crux of the situation. When dislocation occurs the head must go somewhere, and in recurrent dislocation it often moves forward with little or no violence behind it, so that one gets the impression that there must be a space of some kind ready to receive it.

THE CAPSULAR LESION

As a rule, when dislocation occurs the capsule is torn. After reduction of the dislocation, the torn capsule heals and the joint returns to its normal condition. In cases of recurrent dislocation this return to the normal condition is not achieved. Healing does not occur. There is a persistent lesion which has been lucidly described by Bankart, who says—"In its passage forwards the head shears off the fibro-cartilaginous glenoid ligament from its attachment to the bone. The detachment occurs over practically the whole of the anterior half of the glenoid rim. The reason why the dislocation recurs after reduction is that, whereas a rent in the fibrous capsule heals rapidly and soundly, there is no tendency whatever for the detached glenoid ligament to reattach itself to the bone. The defect in the joint is therefore permanent, and the head of the humerus is free to move forwards over the anterior rim of the glenoid cavity on the slightest provocation."

From such a joint, a blunt instrument can at operation be passed easily over the anterior margin of the glenoid cavity on to the neck of the scapula, where it comes to rest under the subscapularis muscle in a space which is the "cavité" referred to by Broca.

The method by which this distinctive flaw is produced must be a subject for conjecture.

Formerly, dislocation was believed to occur usually by a simple process of leverage with the arm in full elevation, the acromion process supplying a fulcrum, and the shaft of the humerus acting as the long arm of a lever which forced the head of the humerus away from the glenoid cavity and through the lower part of the capsule. Bankart suggested that in those cases which subsequently became recurrent, the mechanism of dislocation is not leverage but a direct drive. He believes that in this type of dislocation the violence is applied directly to the humeral head, either by a blow behind the shoulder or by a fall backward on to the point of the elbow, with the shoulder joint extended. The head of the humerus is thus driven directly forward out of the glenoid cavity, and so produces the lesion already described. This theory is reasonable, but in actual fact a history of this type can only rarely be obtained from the victim of recurrent dislocation.

Codman's views on the mechanism of dislocation illuminate this aspect of the problem. In the course of his study of the shoulder joint he showed that as the arm is elevated the range of rotation at the shoulder joint diminishes progressively and when full elevation has been obtained, rotation is almost abolished, the joint being locked in such a position that the internal epicondyle of the humerus points forward. The important point is that in any degree of elevation, and whatever the plane occupied by the humerus, the range of rotation is defined by limits which are maintained so strictly that if the rotating force is continued dislocation or fracture must occur.

As an example, dislocation sometimes occurs during the manipulation of stiff shoulders, not by leverage of the shaft of the humerus against the acromion process in full elevation, but before the position of full elevation has been reached. The dislocation is caused by a forcible attempt to elevate the humerus in the coronal plane without first obtaining full external rotation. The surgeon may easily convince himself by personal trial that full elevation in the coronal plane is possible only if the humerus is in the position of full external rotation, while internal rotation is necessary for full elevation in the sagittal plane. Infringement of these rules must result in dislocation or in fracture. Elevation and rotation are both of great importance in the mechanism of dislocation of the shoulder joint.

The patient with a traumatic dislocation of the shoulder is seldom able to describe accurately the mechanism by which his injury was produced, but it is clear that one possible method is by the application of a force which violently abducts the humerus in the coronal plane while the shoulder joint is in a position of internal rotation. Again, a shoulder joint may be dislocated by rotation with the arm in any degree of elevation, and dislocation becomes easier as the arm is raised because the limits of rotation are correspondingly restricted. Rotation rather than abduction leverage seems to be the mechanism by which dislocation is, as a rule, produced. On theoretical grounds rotation would appear to be capable also of producing the peculiar lesion which leads to recurrence of the dislocation. At any rate this mode of injury is as likely to occur as that from the direct drive described by Bankart.

Whatever its cause, the essential characteristic of the lesion is its permanency, and this fact indicates an important principle in treatment: namely, no dislocation of the shoulder joint uncomplicated by fracture, nerve injury, or damage to the tendons should be immobilized. Free movement may be permitted at once when the dislocation has been reduced. By this means recovery will be accelerated if the dislocation is of the ordinary type, and if, on the other hand, the lesion which leads to recurrence of the dislocation is present, no harm will be done, because such a lesion cannot be induced to heal by immobilization of the joint. It can only be repaired by surgical measures.

Bankart's views have been stated at length because he has established the pathology of recurrent dislocation of the shoulder joint beyond doubt. He has operated on some 30 cases, in each of which the typical defect was discovered. The lesion is obvious when the joint is exposed at operation, and it has failed to secure more widespread recognition probably because the dissection required to expose it is extensive and sometimes difficult.

Many surgeons have described a capsular lesion. Perthes and Eden gave an account not unlike that of Bankart. Cotton and Morrison observed laxity of the capsule and, in addition, a "retraction of the subscapularis." Gallie believes that damage to the inferior glenohumeral ligament is the cause of recurrent dislocation of the shoulder joint.

TREATMENT

Many procedures have been devised for the treatment of recurrent dislocation of the shoulder joint, and most of them have been practiced by their authors on numerous occasions and with almost uniform success.

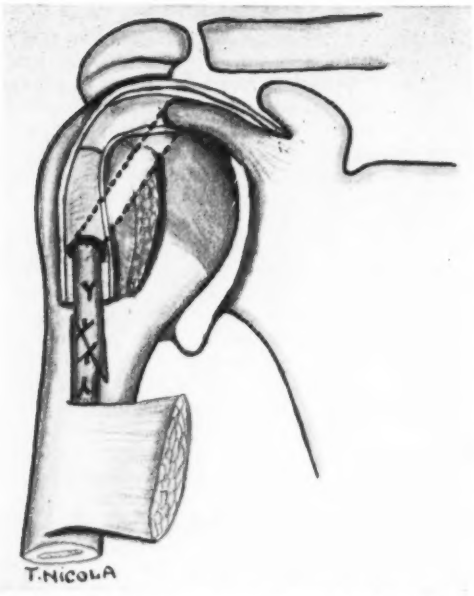

Fig. 1. Showing new course of long head of biceps through head of humerus. (Nicola. J. Bone & Joint Surg., 1934, 16: 663.)

Codman's method of treatment by means of exercises to improve the muscular control of the joint, and Young's operation to lengthen the pectoralis major and latissimus dorsi have already been mentioned. They are not much used. Clairmont's muscle-sling operation which was once popular has been discarded because it is both difficult and unreliable.

The bone-block operations are still in use, but by a decreasing number of surgeons. The principle is simple. A bony block is introduced in front of the shoulder joint to prevent forward movement of the head of the humerus. Some surgeons use a tibial graft implanted into the neck of the scapula (Eden, Speed, Hildebrand); Bazy and Calvet base the graft on the coracoid process. Oudard divides the coracoid process obliquely, and by sliding the two portions on one another increases its length in a downward direction. This operation is combined with plication of the capsule. The bony block is provided by the elongated coracoid process. An obvious objection to the bone-block operations is that the joint must continue to be vulnerable during the considerable time which will elapse before the graft has taken firmly.

The "sling" operations, of which there are several varieties, are the most widely used. The principle of these operations is very simple. A strip of living suture material is used to tether or support the head of the humerus, the proximal end being attached to the scapula.

Henderson uses a piece of peroneus longus tendon. One half of the tendon is removed from the leg over a distance of several inches and is then passed through drill holes in the surgical neck of the humerus and in the acromion process to form a loop which suspends the head of the humerus from the acromion process.

Nicola exposes the long head of the biceps and severs it at its junction with the muscle belly. He then drills a tunnel in the head of the humerus, starting below at the lower end of the bicipital groove and emerging on the articular surface about ½ in. from its upper end. After its surface has been roughened, the tendon is passed through this tunnel from above downward, and its distal end is reunited to the muscle belly by sutures. Nicola stresses the point that the upper end of the tunnel must be a good ½ in. from the margin of the articular surface, because he believes that otherwise the tendon will be unable to control the head of the humerus when the arm is in full abduction.

Roberts has modified Nicola's operation. He does not drill a tunnel in the head of the humerus but merely deepens the bicipital groove.

Hey Groves uses a piece of fascia lata and passes it underneath the shoulder joint from front to back.

All these sling operations are designed to give stability by the introduction of artificial ligaments which have no parallel in the natural state of the shoulder joint. The two operations which remain to be described fall into a different class. Their principle is contained in a remark made by Gallie when, in considering dislocations in general, he said, "The chief point of the matter is that, if operative treatment for these injuries has been decided upon, the anatomy of the part must be reviewed carefully, and that technique decided upon that will enable the surgeon to restore both the anatomical structure and the function of the injured ligament most perfectly."

Now Gallie believes that recurrent dislocation of the shoulder joint is caused by a defect of the inferior glenohumeral ligament, as mentioned before, and he therefore treats the condition by "the introduction of a new inferior glenohumeral ligament which will prevent the head from sliding downwards and forwards when the appropriate leverage is applied." The shoulder joint is

Fig. 2

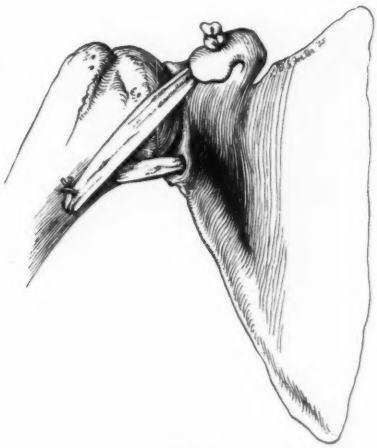

Fig. 3

Fig. 2. Drawing of scapula to show how the new inferior glenohumeral ligament is attached to the bone. Fig. 3. Operation completed with new inferior glenohumeral ligament in place and finally attached to tip of coracoid process. (Gallie. New England J. Med., 1935, 213: 91.)

exposed by an anterior incision. The deltoid and pectoralis major are separated. The muscles arising from the coracoid process are retracted inward and the subscapularis is retracted upward and inward, the anterior aspect of the shoulder joint being thereby exposed. Four holes are then drilled, one in the coracoid process, one in the neck of the scapula, and two in the neck of the humerus. Through a stab wound behind the shoulder, a piece of fascia lata with a knot in one end of it is drawn forward through the hole in the neck of the scapula, until the knot comes to rest on the posterior surface of the neck of the scapula. The strip of fascia is then passed through the holes in the neck of the humerus and in the coracoid process (see Figs. 2, 3). The new ligament is drawn to such a tension that when healing has occurred, abduction and external rotation of the joint will be slightly limited.

Bankart's operation is directed to the repair of the lesion which he has shown to be the real cause of recurrent dislocation. Through an anterior incision the deltoid and pectoralis major are separated. The coracoid process is divided with an osteotome, and the tip is then reflected downward together with the three muscles which are attached to it. The subscapularis tendon is thus exposed, and is divided. The anterior aspect of the shoulder joint is thus brought fully into view. The anterior margin of the glenoid cavity is always found to be "smooth, rounded, and free of any attachments, and a blunt instrument can be passed freely inwards over the bare bone on to the front of the neck of the scapula." The neck of the scapula is then roughened by raising a thin flake of bone from it with an osteotome. With a right angled drill, driven by an electric motor, four holes are drilled from the raw surface on the front of the neck of the scapula to the cartilaginous surface of the glenoid, and through these holes two mattress sutures of silk-worm gut are passed, which reattach the free edge of the capsule (and the glenoid ligament) to the bone.

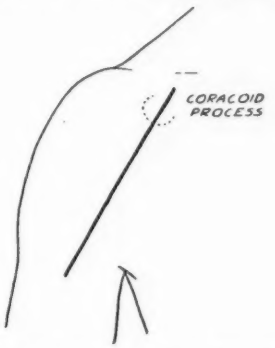

Fig. 4. The incision. (Bankart operation.)

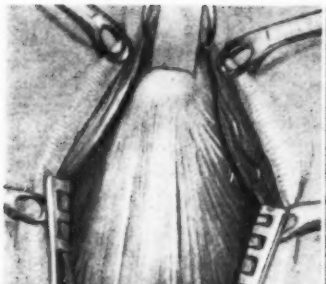

Fig. 5

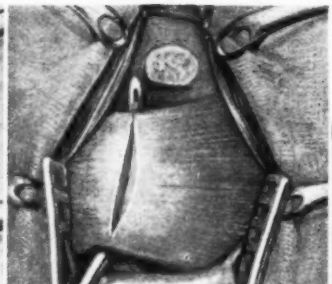

Fig. 6

Fig. 7

Fig. 5. The deltoid and the pectoralis major muscles have been separated, showing the coracoid process and the three muscles attached to it. An osteotome has been applied to the upper surface of the coracoid process.

Fig. 6. The coracoid process has been divided and the detached portion has been drawn downward with the muscles attached to it. The tendon of the subscapularis is seen with an aneurysm needle passed beneath it. The tendon has been partially divided.

Fig. 7. The tendon of the subscapularis has been divided and the muscle has been retracted inward. A transverse opening is seen in the capsule of the joint, the outer edge of which lies on the head of the humerus, while the inner edge, which includes the glenoid ligament, has been raised by a hook from the anterior margin of the glenoid cavity. Note that the glenoid margin is smooth and rounded. (Bankart operation.)

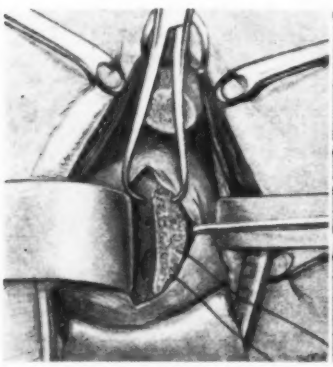

Fig. 8

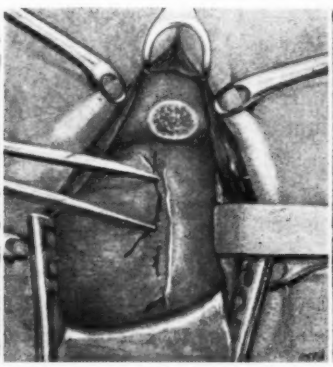

Fig. 9

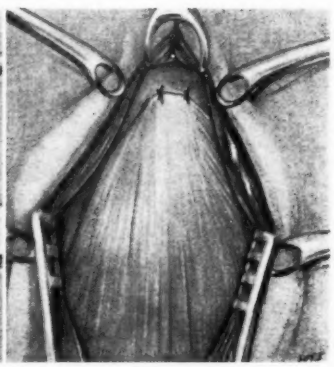

Fig. 10

Fig. 8. A thin shaving of bone has been raised from the anterior margin of the glenoid cavity and the neck of the scapula. Three holes have been made in the glenoid margin, and a pair of vulsellum forceps is seen in the act of making a fourth hole. A suture has been passed through the two holes in the lower half of the glenoid margin, and the two ends of this suture are seen emerging from the raw surface on the front of the neck of the scapula.

Fig. 9. The free edge of the capsule has been drawn inward and placed on the raw surface of bone in front of the glenoid margin and neck of the scapula. The two sutures have been passed through the edge of the capsule. The lower suture has been tied, and is shown with its ends cut short. The upper suture is being tied with two pairs of forceps.

Fig. 10. The subscapularis tendon has been sutured with catgut. The detached portion of the coracoid process has been replaced, and is shown held in place by two sutures of silkworm gut. (Figs. 4–10, inc.—Bankart. Brit. J. Surg., 1938, 26: 23.)

The subscapularis tendon is sutured with catgut, and the coracoid process is repaired with silkworm gut or with wire. After this operation the arm must be bandaged to the side for one month.

RESULTS

It appears from the literature that nearly all the operations described in this paper give very good results. Nicola reports 37 cases, with only 1 recurrence, which was due to violence so severe that it probably ruptured the tendon of the long head of the biceps. Horwitz and Davidson report 25 cases in which Nicola's operation was performed. Of these 20 were followed up, and in 17 the operation was found to be completely successful. Hey Groves has 10 cases, 9 of which showed successful results. Henderson records 29 cases, of which 27 presented perfectly successful results. Gallie had 33 perfect results among 35 cases. Bankart has performed his operation on 30 patients and there have been no recurrences, nor any restriction of movement, in any of these cases. Moseley traced 8 of a series of 10 cases on which Clairmont's operation had been performed. Only 2 showed completely successful results. Two patients had suffered frequent recurrences. The remaining 4 patients had recurrences soon after the operation, but not subsequently.

Nicola's operation is the most popular at the present time. The idea is ingenious and fairly simple to execute. Henderson's technique has the disadvantage that it requires an operation upon the leg. The operations of Gallie and Bankart have not received much attention, possibly because the glenoid margin is so far from the surface. The dissection is certainly extensive, but it is straightforward. Bankart's operation, in particular, since it is a direct attack on the pathology of recurrent dislocation, should be more widely used.

NOTE.—This review has been concerned only with anterior dislocations, because posterior dislocations, either solitary or recurrent, are very rare indeed.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Brosch, F.: Suppurative Inflammations of the Jaw (Ueber eitrige Kieferentzuendung). *Ztschr. f. Stomatol.*, 1939, 37: 172, 234, 303.

On the basis of anatomical material derived from 6 briefly described clinical cases of suppurative inflammation of the jaw, the pathological changes in the tissues were exhaustively discussed. The disease in its widest meaning includes pyogenic infections of the jaw bone, as well as of the soft tissues. The discussion concerns first the disease of the bone, its destruction, and the extension of the infection, also the process of sequestration and the fate of the sequestrum; then the changes in the paradentium and the influence of the disease upon the pulp of the tooth. Finally, a critical analysis, based upon the results of these studies, is given of the usual treatment, particularly the surgical, of the frequent, small bone abscesses. The very lengthy work is illustrated with numerous photomicrographs and includes a brief review of the literature.

It has been shown that the destruction of bone occurs as a lacunar resorption and necrosis with subsequent sequestration. The immediate cause of the former is the increased tissue pressure during the first phase of the disease, produced by the inflammatory changes in the marrow cavity. Locally produced destructive processes are in the background at first. Near a larger zone of lacunar destruction, there is a smaller one of suppurative-tissue liquefaction. This shows that dissolution of the bone by pus does not occur. There is, however, the possibility of bone sequestration from the action of toxins. Nevertheless, most of the cases of sequestration develop as bland bone necroses with secondary infection. The complete infiltration of a region by toxins would not account for pieces of bone with a uniformly necrotic appearance, yet which retain at their margins, cells ranging in all stages of viability to complete destruction. Bland bone necroses arise, presumably, from disturbances of nutrition which are only indirectly associated with infection. Severe vascular damage is demonstrable in the vicinity of the dead bone. The bone marrow also sustains tissue damage which leads to hemorrhage and favors the subsequent suppurative liquefaction.

In the healing stages of the disease, the secondarily infected sequestra are unquestionably the foci of infection. Their infectiousness persists long after the disease has healed. Detoxification occurs slowly by diffusion of the toxins. Only then do the sequestra become restored or replaced. Finding large, unaltered and unabsorbed sequestra may lead to the assumption that entirely healthy bone died from the effect of toxins. It was shown that such toxins could not have been overwhelming, but that certain prerequisites for lacunar resorption were lacking. Smooth necrotic margins do not justify the belief that the bone destruction resulted from general agents, such as pus. The finding of remains of osteoclasts indicates destruction superimposed upon lacunar resorption.

The first layers of periosteal involucrum formation are immediately superjacent to the surface of the necrotic bone. The new growth does not occur in the periosteum which has been elevated by the pus. The separation of the sequestrum from the involucrum takes place, among other phenomena, by means of vascular resorption. The bone also seems to be able to reconstruct its central portions after severe damage. The apical portion lags behind the marginal in this regard. Tissue zones which remain infected become encapsulated from those which have already healed.

Loss of substance of the tooth is greater in the apical portion than in the marginal. Reparation by the deposition of cement is complete throughout. The connective-tissue paradentium succumbs very largely in its apical portion to the suppurative liquefaction, but the marginal part remains completely intact, although it loses its functional structure. There are intimate connections between tooth and alveolus. Loosening of the teeth during the disease is not due to dissolution of the root membranes, but to loss of the alveoli as supports. Tooth tissue surrounded by suppuration is able, within a short time, to participate in reconstruction and to become re-implanted in healthy tissue without reaction.

For the persistence of infectious processes in the neighborhood of teeth, including periapical foci, it is not the teeth but damage to other tissues that is responsible. The possibility of retaining viable pulp in the infected area is slight. Suppuration, necrosis, and fibroreticular atrophy occur.

Circumscribed bone involvements in inflammations of the jaw should be called bone abscesses rather than osteitis. Separation of periapical bone abscesses from other inflammatory jaw-bone diseases is not logical. Extraction of the teeth in inflamed tissue constitutes the immediate trauma that results in inflammation of the jaw. The retention of the teeth in spite of infection, and changes in the tissues in periapical bone abscesses indicate that in resections of the root tips, the emphasis of treatment is to be placed on the bone and not on the teeth. As in sequestrotomy, flattening of the bone margins should be considered a factor which favors healing. (HEINEMANN-GRUEDER). LEO M. ZIMMERMAN, M.D.

EYE

Guyton, J. S.: The Use of Sulfanilamide Compounds in Ophthalmology. *Am. J. Ophth.*, 1939, 22: 833.

An excellent and inclusive review of the present status of sulfanilamide compounds in general medicine, and their use in ophthalmology, is included in this article. Previous reports indicate that these drugs are of value in the treatment of gonococcal conjunctivitis and trachoma, of probable value in the treatment of inclusion blennorrhea, and of possible value in certain cases of panophthalmitis, cavernous sinus thrombosis, herpes simplex, and herpes zoster. The reported successful use of prontosil solution in the eye is doubted, although a solution of sulfanilamide itself may have potential value.

The cases of 43 patients treated with sulfanilamide compounds in the Johns Hopkins Hospital because of ocular inflammations are reported. The results obtained were as follows:

1. No appreciable effect was noted in 14 cases of "gonococcal" uveitis, in which type of condition the author has obtained spectacular results with induced hyperpyrexia.

2. No apparent benefit was obtained in 5 cases of ocular tuberculosis.

3. Four of 8 cases of purulent intra-ocular infection exhibited spectacular cures. In 1 of these the infection was found to be a metastatic meningococcal panophthalmitis; 1 was a postoperative panophthalmitis with the beta streptococcus in the anterior chamber; 1 was a postoperative panophthalmitis with the staphylococcus aureus in the conjunctival sac; and the fourth was a postoperative endophthalmitis of unknown cause.

4. Significant results were obtained in 5 cases of infection of the lids or orbit; 4 of the cases were known to be due to the beta hemolytic streptococcus.

5. Improvement was noted in 2 cases of trachoma in the third stage; 2 other cases of trachoma showed more marked improvement following the intravenous administration of tartar emetic.

6. Two cases of inclusion blennorrhea were cured within six days.

7. A cure of doubtful significance was obtained in 1 case of pneumococcal conjunctivitis and corneal ulcer by the use of sulfapyridine.

8. One case of corneal ulcer associated with streptococcal and staphylococcal conjunctivitis responded significantly.

9. No appreciable effect was noted in 5 miscellaneous cases.

WILLIAM A. MANN, M.D.

Stokes, W. H.: Transplantation (Implantation) of the Lacrimal Sac in Chronic Dacryocystitis. *Arch. Ophth.*, 1939, 22: 193.

The advantages of dacryocystorrhinostomy as compared to those of extirpation of the lacrimal sac are widely recognized, although the technical difficulties of performing the first operation are frequently the reason that dacryocystectomy is performed. The technique of implantation of the lower end of the tear sac into the nose, as successfully reported by Stokes, includes the usual local anesthesia; an incision half way between the inner canthus of the eye and the side of the nose, at least 12 mm. from the inner canthus; elevation of the periosteum and exposure of the sac; freeing of the sac to the entrance of the canal where it is cut; introduction of silk sutures in the wall of the sac; perforation of the bone with an 8 to 10 mm. trephine with a center pin; removal of the trephined bone and nasal mucous membrane; destruction of the mucosa of the old nasolacrimal duct; and passing of the sutures in the wall of the sac through the new opening into the nose, when they are drawn through the nostrils and fastened to the skin of the cheek with adhesive. The sutures are removed on the sixth day. This technique obviates the difficult suturing of the lacrimal-sac wall to the nasal mucous membrane required in several of the more popular types of operations, and, according to the author, is sufficient to obtain a satisfactory result, that is, freedom from epiphora and other symptoms referable to the eye. The author has not found it efficacious in the small atrophic type of sac or when slitting of the canaliculi has been performed previously. Emphasis is placed upon removal of the nasal impediments.

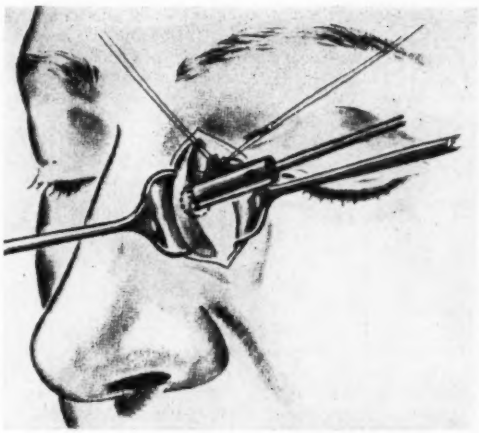

Fig. 1. A trephine 8 to 10 mm. in diameter with a center pin is applied to the bone toward the lower part of the ascending process of the maxilla.

A complete table of patients operated on by this method is included in the paper.

WILLIAM A. MANN, M.D.

Buxton, R.: The Intracapsular Extraction of Cataract with Forceps: Is Its Use Justifiable? *Brit. J Ophth.*, 1939, 23: 505.

Of the various methods of intracapsular extraction, namely Smith's expression method, Barraquer's

suction method, electrocoagulation of the lens, and forceps extraction, the author discusses the last. It would take much space to compare these methods, and the technique of the forceps method is probably the easiest to acquire and, as Kirwan recently stated, the least dangerous.

Wright has recently written that even after years of consideration and vast experience, it is uncertain whether intracapsular extraction is better than extracapsular extraction when the latter is well done. An eye with its zonula-capsule barrier intact, provided that the vision is good, is, *prima facie*, a better eye than one in which it is not intact.

A ruptured capsule is common and unpleasant. It is not serious if the capsule bursts at an early stage in the tumbling operation. If it occurs when the suspensory ligament is only partly broken and masses of soft lens matter escape, or if vitreous prolapse occurs, a dense after-cataract forms.

A ruptured capsule brings the risk of iritis, secondary glaucoma, or generalized infection of the eye. This complication varies according to (1) the type of cataract; (2) the type of forceps; (3) the age of patient; and (4) the operator's technique and skill. Castroviejo held that there was a decreasing chance of success in the following list: (1) soft cataract; (2) immature cataract and uncomplicated cataract; (3) nuclear cataract; (4) Morgagnian cataract; (5) black cataract; and (6) intumescent cataract.

Any conditions which hinder the delivery of the lens are likely to cause rupture of the capsule. These include a too small corneal section; a section finishing in the cornea and not at the limbus; a relatively large lens with a relatively small cornea; mydriasis less than 7 mm.; the use of unsuitable forceps; careless introduction of the forceps; the grasping of a piece of capsule more or less than 2.5 mm. wide; hurrying of the lens extraction, both before and after the lens has started to tumble; too much traction instead of pressure from below when the lens has started to tumble.

Vitreous prolapse is a very undesirable complication. It predisposes toward infection, iridocyclitis, secondary glaucoma, vitreous degeneration which may diminish visual acuity, probable detachment of the retina, choroidal hemorrhage, and, according to Knapp, a toxic optic neuritis.

Corneal opacities are a complication which is comparatively common in intracapsular work. If intracapsular extraction is complicated by ruptured capsule or prolapse of the vitreous, glaucoma may follow.

There is a rather greater likelihood of hyphemia in intracapsular extraction than in extracapsular extraction.

There is less likelihood of iritis and iridocyclitis in an uncomplicated intracapsular operation, for cortical remnants and capsular tags which may cause trouble are absent.

In the absence of complications, infection is probably less frequent and more benign in the intracapsular operation.

It is sometimes held that one of the greatest bugbears of the operation is the increased risk of the occurrence of retinal detachment afterward.

The patient should be co-operative and should not be nervous or restless. The operation is contraindicated in very old or deaf patients who cannot be relied upon for co-operation. One-eyed patients should have the extracapsular operation.

It is probable that fifty-five years should be the lower age-limit, with possible exceptions in the case of low myopia and cataract following iridocyclitis. A patient of advanced age, unsuitable because of temperament or general or ocular disease, will, of course, contraindicate the operation. There is an added risk of vitreous prolapse. The risk is increased when the zonula is excessively friable or even dehiscent in part and fluid vitreous may have found its way into the posterior chamber. Vascular disease is more common in the aged, with an increased risk of choroidal hemorrhage. It is suggested, therefore, that the operation should not be performed when the patient is more than eighty years old.

General disease, e.g., cardiovascular renal disease, elevation of the blood pressure, or marked arteriosclerosis, renders the operation unsuitable by increasing the risk of complications. Diabetes, when controlled, is not a contraindication; however, the lens matter after extracapsular extraction may set up unpleasant iridocyclitis in the presence of diabetes. Cough, asthma, an enlarged prostate, piles, mental affections, cardiac failure, habitual sneezing, cystitis, or vaginal discharge, which gives rise to straining, renders a patient unsuitable for operation. Goodman, in an article on endophthalmitis phaco-anaphylactica, recommends intracapsular extraction in all favorable cases when there is any reaction to the cutaneous test with lens protein.

In local disease, such as myopia, there is a greater risk of prolapse of the vitreous, especially in the higher degrees of myopia. If vitreous prolapse should occur, there is a possibility of detachment of the retina, secondary glaucoma, organization of the vitreous, or drawn-up pupil. It is probably wiser not to perform intracapsular extraction in exophthalmos. If eye tension is within normal limits, glaucoma is no contraindication to the operation.

In certain types of cataract and in complicated cataract the triumph of the intracapsular operation may be seen. All authorities appear to be agreed that intracapsular extraction is not indicated for intumescent cataract. In traumatic cataract and dislocated cataract it is possible that the hyaloid membrane and zonula are weak or have ruptured, and, if so, vitreous prolapse is likely. All authorities are agreed that the immature cataract is the most suitable type for the intracapsular method. There is little doubt that the mature cataract is a suitable condition for intracapsular extraction.

One of the most important details in intracapsular work is satisfactory mydriasis.

For anesthesia of the conjunctiva various concentrations of cocaine, with or without adrenalin,

are popular, e.g., cocaine 4 per cent, with adrenalin 1:3,000; 6 instillations of 2 drops at two-minute intervals, with 1 drop in the other eye are given.

Retrobulbar anesthesia is of great value in intracapsular work. However, there are a number of disadvantages. It requires more time; there is a slight risk of retrobulbar hemorrhage, which causes alarming proptosis and necessitates postponement of the operation; the softening of the eye may be so marked that the capsule is difficult to grasp with the forceps; if the extra-ocular muscles are paralyzed, the patient cannot fix properly; the adrenalin in the injection fluid sometimes causes complete temporary amaurosis from contraction of the retinal blood vessels; there is an increased risk of bleeding from the conjunctival flap.

For the anesthetic solution various concentrations of novocaine and adrenalin are commonly used.

As to corneoscleral suture, few operators who use the intracapsular method will question the value of some kind of suture for securing the corneoscleral wound firmly.

The advantages of suture are: (1) control of the wound; (2) immediate and firm coaptation of the wound as soon as the suture is tied; (3) quick reestablishment of the anterior chamber and considerable decrease in the liability of the iris to prolapse. Further, the rare and serious complication of reversed corneal flap is obviated. The suture protects the wound after operation; this is especially important in elderly patients who should move about and get up early. The risk of postoperative hyphemia is very considerably lessened by suture. Suture is also an aid to fixation and to the introduction of the capsule forceps. Postoperative astigmatism tends to be reduced following suture. A superior rectus suture is an added precaution.

A self-retaining speculum which does not press upon the eyeball is essential. Fixation of the red lamp is to be recommended.

The incision should be larger than usual and extend just above the horizontal diameter of the cornea at the limbus and finish with a narrow edge of conjunctiva.

With intracapsular extraction without tumbling, it is almost essential to perform a complete iridectomy in order to grip the upper border of the lens correctly. However, recently in America a pair of forceps has been devised with a heel for raising the pupillary border of the iris which obviates the necessity for iridectomy.

It is important that the forceps should be so made that the blades are in exact apposition to each other, that the grip is of equal strength all along the blades, and that they have no roughness which might cause tearing of the capsule. The introduction and grasp of the forceps should be done with the greatest gentleness.

In the postoperative treatment both eyes are bandaged for forty-eight hours. After twenty-four hours, a drop of 1 per cent atropine is instilled into the eye which has been operated upon. This eye is dressed, and 1 per cent atropine is instilled daily into it until the eye is white. Dark glasses should be given on the eighth day and spectacles at the end of six weeks. LESLIE L. MCCOY, M.D.

EAR

Scott, P., Colledge, L., Woodman, M., Ormerod, F. C., and Others: Discussion on Malignant Disease of the Ear (Excluding the Pinna). *Proc. Roy. Soc. Med.*, Lond., 1939, 32: 1087.

SCOTT: This paper is an analysis of 70 cases of malignant disease of the ear. Among the factors which may arouse suspicion of malignancy are: toughness of the granulations when touched with a probe; recurrence after removal and a tendency to bleed easily; persistence of meatal infection in spite of cleansing treatment; pain on chewing; and the presence of granulations or papillomas attached to the deep meatal wall. Malignant disease of the ear is divided into four groups: carninoma, sarcoma, rodent ulcer, and endothelioma. Carcinoma is by far the most common type of malignant disease to affect the ear, and may be primary or secondary.

Primary carcinoma, almost always squamous-cell in type, may be identified by early or late involvement of the tympanum. It is believed that all squamous carcinomas arise somewhere in the fundus of the external meatus, and spread inward to involve the tympanum early. The meatus appears to be the starting point in the majority of instances. In another group of cases the tympanum is not involved until late in the disease. In the first group the symptoms are those of chronic suppurative otitis media, while in the second the symptoms are more commonly those of a severe otitis externa—pain, irritation, and discharge.

Sarcoma and endothelioma present few features which, apart from histology, serve to distinguish them from carcinoma. Rodent ulcer shows a slower rate of growth. Treatment by surgical measures may be divided into two essential types: (1) meatal operation, and (2) radical operation. When there is an ulcer in the meatus without any apparent involvement of the tympanic membrane or past history of chronic suppurative otitis media, sleeve resection of the meatus, with the skin of the bony meatus, and in some cases the pinna, has been carried out with some measure of success, especially if followed by some form of radiotherapy. However, when there is the slightest doubt about the integrity of the drum membrane, or if chronic otitis media has preceded the onset of malignant disease, radical mastoid operation, together with meatal excision, should be performed. Subsequent diathermy or radiotherapy may be employed. In 26 of the 70 cases under discussion, complete surgical excision alone was carried out; complete surgical excision combined with diathermy was done in 10 cases, complete surgical excision combined with radiotherapy in 14 cases, radiotherapy alone in 10 cases, and treatment was not recorded in 10 cases.

COLLEDGE: This author gives a composite account of the clinical and pathological features of carcinoma of the middle ear. In defining malignant disease it is necessary to include the petrous portion of the temporal bone and the deeper portion of the external auditory meatus, but disease of the pinna itself is expressly excluded. A long history of chronic otorrhea preceding the development of the tumor usually occurs, but not always. It is natural to regard malignant disease in the temporal bone as a primary manifestation, but it may arise even more rarely as a secondary condition from a carcinoma in some common situation such as the breast. The most common type of tumor arising in this location is the squamous-celled epithelioma with keratinization. The clinical course of malignant disease in the temporal bone seems to involve relatively easy spread through the bone with enormous destruction. In the matter of diagnosis the comparative rarity of the disease is likely to cause it to be overlooked at an early stage. Granulation tissue without suppuration or spontaneous bleeding may arouse suspicion so that early diagnosis can be readily made by biopsy. The prognosis is naturally grave. Provided the growth is still in a reasonably early stage, and has not advanced to the stage of diffuse infiltration, the best treatment is excision.

WOODMAN: This author discussed 7 cases of malignant disease of the ear seen during the period from 1930 to 1938. Four of the patients were dead and 3 were alive and free from recurrence. The analysis of the fatal cases was perhaps more interesting than the record of the successful ones. Of the 4 patients who died, 2 died of extension of the disease through the tympanic membrane into the middle ear, and 2 of the invasion of the parotid gland and the brain through the parietal region. Radon, the radium tube, and the radium beam had proved almost useless. In not 1 of the 3 successfully treated cases had radium or any like agent been able to check the disease. On the other hand, diathermic excision in combination with prophylactic radiation afterward had proved successful. The excision must be as adequate and complete as possible.

ORMEROD: One case included in Scott's list was treated by operation in 1928 and later by insertion of radium needles. There was complete disappearance of the tumor for one year. It then recurred, and a sleeve resection was performed, without any further use of radium, and the condition cleared up. It is now ten years since the surgical operation. The radium failed to cure the condition, but sleeve resection was effective.

MCCAY: A case was discussed which showed how easily a carcinomatous condition of the ear might be missed in a patient who had had a radical mastoid operation for recurring aural polyps. The polyps recurred years later and histological examination showed the condition to be a basal-cell carcinoma.

TILLEY: It was Tilley's custom to teach students to be suspicious of malignant disease of the tympanic regions when an adult complained of deafness, deep-seated pain in the ear, and a foul-stained secretion which had developed without any preliminary constitutional symptoms of infection of the middle-ear cleft.

MOLLISON: Microscopical examinations were sometimes misleading, according to Mollison. He mentions a case to illustrate this point.

NOAH D. FABRICANT, M.D.

NOSE AND SINUSES

Weiss, J. A.: Scleroma (Rhinoscleroma): Histological Changes Following Teleradium Therapy; Review of Scleroma in the United States. *Arch. Otolaryngol.*, 1939, 30: 38.

The author contributes 2 cases of nasal scleroma to the 58 cases previously reported in the American literature. Recognized by its more frequent occurrence in the foreign-born; the great chronicity of its course; the hardness of the lesions; the absence of pain, ulceration, or systemic involvement; and by the eventual cicatricial deformities with stenosis; scleroma challenges any one single method of management for a uniformly successful control. Oral medication, intravenous chemotherapy, local application of caustics, electrocoagulation, foreign-protein therapy, intubation, and surgical intervention have proved futile or only partially successful.

Weiss believes that teleradium therapy with higher doses will eradicate circumscribed scleromatous lesions and in all probability prevent recurrences. In his first case distance irradiation with a dose of 32,000 mgm. hours effected complete regression of the lesion. Subsequent surgical correction of the nares was required. During a period of two and one-half years no recurrence was observed. In the second case excision of a small nodule was followed by prophylactic irradiation with a dose of 20,000 mgm. hours. One year has elapsed without recurrence of the lesion.

The histological changes in scleroma following intensive irradiation include extensive fibrosis, increased hyalinization, decreased cellular content of the stroma, and disintegration and disappearance of the Mikulicz cells. NOAH D. FABRICANT, M.D.

MOUTH

Milian, M. G.: Plasmocytoma of the Tongue (Plasmocytome de la langue). *Bull. et mém. Soc. méd. d. hôp. de Par.*, 1939, 55: 908.

A plasmocytoma of the tongue in a fifty-eight-year-old male is reported. The initial symptoms were prickling sensations followed by increasing pain which later became incapacitating. There was extreme general fatigue and a loss of 20 kgm. in weight.

The patient was first seen six months after the onset of the symptoms. The tongue was garnet-red in color and tripled in size with most of the enlargement on the right side. There were irregular ulcera-

tions on the right side with many small yellow nodules the size of a pinhead. The left border was indurated and on the superior surface in this region there was a rounded sessile elevation the size of a franc. There were 3 small papular, ulcerated lesions on the mucosa of the left cheek near the angle of the mouth and there was a bilateral submaxillary lymphadenopathy in which the nodes were hard, mobile, and not tender. No tubercle bacilli were found. The patient gave no history and had no clinical signs of syphilis, and the serology was repeatedly negative. In the initial blood count there were 34,600 leucocytes with 87 per cent polynuclears, 7 per cent monocytes, 4 per cent lymphocytes, and 2 per cent plasmocytes.

In spite of the lack of luetic findings, the lesion so closely resembled a gumma that a course of antiluetic therapy was tried. No result was obtained, so x-ray therapy was given. With this, the pain decreased, the tongue became less violaceous, the submaxillary glands decreased in size, and the patient was able to eat.

Several months later, the patient died of a spreading erysipeloid infection of the head and neck. At autopsy, the tumor was found in the local region, including the tongue and cheek, and in one small implant in one kidney. Sections of the tongue lesion showed it to consist almost entirely of plasmocytes growing in a connective-tissue stroma. The tumor cells had replaced the submucous layer, in many areas being covered only by a thin layer of epithelium. In their downward invasion, they separated the muscle fasciculi. The plasmocytes had typically round nuclei with eccentric granules and ovoid or trapezoid cytoplasm. There were sometimes 2 nuclei which were equally eccentric, or even 3, in which case they occupied the periphery of a more voluminous cell. Several rare cells with 4 hypertrophied nuclei were seen, the nuclei being tripled in size and the cell correspondingly enlarged. The implants in the pericarotid nodes appeared much the same, except that the connective-tissue reticulum was much more marked and in places appeared alone. Around the periphery, there were a few cells of the reticulum in which the nuclei had multiplied and hypertrophied, and somewhat resembled the cells of Sternberg. In a few areas there had been mass necrosis of the tumor cells which gave an appearance suggesting caseation, but in one area a true fibrocaseous tubercle was clearly demarcated from the necrotic tumor material.

The author notes that plasmocytoma is not a frequent tumor and is usually observed in the bones.

FRANK MCDOWELL, M.D.

NECK

Straus, F. H.: Woody Phlegmon of the Neck. *Surgery*, 1939, 6: 230.

In certain patients chronic low-grade phlegmon of the neck appears to constitute a clinical entity. The process is viewed as an altered response of tissue to an attenuated infecting agent. The pathology is one of simple fibroblastic proliferation. No deaths occurred in the 6 cases described. Differentiation from known infections is discussed. The course of this condition is totally different from that of the rapidly progressive pyogenic phlegmons of Ludwig's angina. Surgery is not valuable except to relieve respiratory obstruction. PAUL STARR, M.D.

Lehman, E. P., and Shearburn, E. W.: Thyrotoxicosis: Including a Study of the Duration of Pre-Operative Treatment. *Ann. Surg.*, 1939, 109: 712.

The length of the pre-operative treatment of thyrotoxic patients is determined by a vaguely defined condition for which objective criteria are lacking. Possibly the longer the pre-operative treatment is—within reasonable limits—the better the operative result. The authors examined their material with this question in mind.

The report concerns 401 cases of goiter, of which 290 were toxic. Two hundred and thirty-one of the patients were females, including 47 colored; 59 were males, including 6 colored. The highest incidence of diffuse goiters lay between the ages of thirty-one and forty, and for nodular goiters, between forty-one and fifty. The pre-operative treatment consisted of bed rest, high carbohydrate diet, sedation, and the administration of Lugol's solution (usually 15 drops t. i. d.). Recurrence took place in 3.97 per cent of all the cases, the percentage being higher in the negroes. The total mortality was 2.41 per cent, 0.84 per cent for the whites and 9.43 per cent for the colored.

Only 1 patient died of a thyrotoxic crisis and 1 of congestive heart failure. The authors emphasize that thyrotoxicosis is highly fatal in the negro, as previously reported from New Orleans.

In charting the length of the pre-operative treatment against the postoperative result, the authors find that there was no relation between its length as compared to the postoperative reaction, nor between the basal metabolic rate and the postoperative course. There was no discernible correlation between the initial severity or the initial basal metabolic rate and the postoperative course, not even if diffuse and nodular goiter were considered separately. There does not seem to be any value in prolonging the pre-operative treatment. It is probable that thyrotoxicosis is a cyclic disease and the postoperative course is determined by the time the preparation begins. FRED S. MODERN, M.D.

Martin, J. D., Jr., and Elkin, D. C.: Hurthle-Cell Tumors of the Thyroid. *Ann. Surg.*, 1939, 110: 169.

Three tumors of the thyroid gland are described with accompanying photomicrographs. One of them was clinically malignant. They resembled Hurthle-cell tumors.

A brief review of the literature is given. No biochemical studies were made. PAUL STARR, M.D.

Zukschwerdt, L.: The Present Status of Surgery of the Parathyroid Glands (Der gegenwaertige Stand der Chirurgie der Epithelkoerper). *63 Tag. d. deutsch. Ges. f. Chir.*, Berlin, 1939.

The stormy development of functional surgery has so enlarged the indications for surgery of the normal parathyroid glands that a critical review is indicated. Prerequisite is a knowledge of the physiology which is based upon the study of function-deficiency of the parathyroid glands. The animal that lacks parathyroid loses its ability to excrete soluble phosphates in the urine. For excretion through the bowel the formation of tricalcium phosphate and the presence of sufficient calcium are essential. The lack of calcium is due to retention of the phosphates. The effect of parathyroid hormones upon phosphate metabolism is based neither upon the lowering of the kidney function for phosphates nor upon the direct effect on the osteoclasts, but rather upon the formation of a soluble but non-ionized calcium-phosphate combination, due to the catalytic effect of the parahormones.

At the present time it is necessary to suspect tetany poisoning. The neurological symptoms of tetany arise neither from the brain nor the spinal cord but from the neuromuscular fibres; this has been shown by cross-circulation experiments. Blood-calcium determination is most desirable as a functional test of the parathyroid, and blood-phosphate determinations are very important, since the contradictory relationship to blood calcium points to parathyroid disease. Determination of the potassium or calcium balance, the phosphatase, the magnesium level, and interferometry have no practical value. The time factor, however, seems to be of value. The continued determination of the blood-calcium in rabbits, according to Hamilton's method, following peroral doses of calcium and the injection of 10 c.cm. of the patient's blood appears to have significance.

In the treatment of parathyroid insufficiency the author first mentions transplantation, a procedure which is now receding into the background. This step is indicated when both the hormone and A. T. 10 are ineffective, or when the medication is too expensive for the patient. The sovereign remedy in the treatment of parathyroid deficiency tetany is A. T. 10 (Holtz). Leriche was successful in employing unilateral cervical sympathectomy in those cases in which hormone therapy of tetany failed. Russian authors have reported favorable results from the implantation of ox bone in the soft tissue (Oppel's method).

The treatment of choice in genuine hyperparathyroid conditions is surgery, especially for cases of osteitis fibrosa generalisata accompanied by parathyroid tumors. Erdheim believed that there was a genuine hypertrophy of the parathyroid due to a disturbed mineral metabolism. Although this belief was suggested, it is not completely accepted. Clinical facts, the differentiation between experimental osteitis and the generalized fibrous osteitis found in the human, as well as the finding of non-toxic adenomas without bony changes make it probable that not only increased function but also pathological function of the parathyroid was present in cases of generalized osteitis fibrosa. Thus, there exists a parallel to Basedow's disease; a second parallel can be found in the importance of the metabolism for generalized osteitis fibrosa. A third similarity of the latter and Basedow's disease presents us with a clew to the understanding of generalized fibrous osteitis:

Similarly, as in hyperthyroidism, there exists a circular chain of events between the periphery (the bone) and the central regulative organ (the parathyroid gland). The central regulative organ works harder in patients with an increased demand of the periphery, as in vitamin deficiency and disturbances of the metabolism. Normally, the increased output is diminished because of the function of the superior glands (the hypophysis) and the central nervous system. However, in cases in which the blockade is lacking there will be increased mobilization of calcium in the periphery and therefore increased parathyroid function. Thus, the circular chain of events becomes clear. In the presence of embryonic elements in the parathyroid, adenoma develops and a normalization of the calcium metabolism becomes impossible. According to Braine and Rivoire, who reported 130 operations on parathyroid patients because of generalized fibrous osteitis, the results were excellent when there was a single adenoma, poorer when multiple adenoma occurred, and most uncertain when the normal parathyroid gland was removed. Recurrences, according to Snapper, are caused by the reappearance of new adenomas. The most common cause of failure was failure to find the tumor because of its hidden location. A disturbance in the superior glands (the hypophysis) may be the cause of the growth of multiple adenomas. Should the surgeon overlook one, this then may be the explanation for failure. Further causes for failure lie in the missed diagnosis of generalized fibrous osteitis, a condition which can be interpreted by roentgenological, clinical, and especially biological findings. The most common cause of mortality following parathyroid removal is tetany, which is due either to the absolute lack of parathyroid tissue or to recalcification.

In 75 per cent of the cases of generalized osteitis fibrosa stone formation is found in the urinary tract. The stone formation is caused by the disturbed mineral metabolism and not by the direct effect of the hormones. Hormone poisoning may lead to uremia. Kidney stones may disappear after the removal of the adenoma. In cases of stone formation with slightly elevated blood calcium but no bone changes, and no parathyroid tumors, the removal of the parathyroid glands should result in healing. However, the author has had insufficient experience with this. In cases of chronic rheumatism with slight inflammation, the removal of the parathyroid may be indicated. The best results are reported in Bechterew disease. The literature reports improvement in 57 per cent of a series of 151 cases. Removal

of the parathyroid gland is indicated in cases of sclerodermia, not to be done too late in the diffuse form of sclerodermia in which there are symptoms of hyperparathyroidism (calcification of the soft tissue, calcium deficiency in bone, and increased blood calcium). Those cases in which secretory disorders of other glands prevail (hypophysis, ovaries, adrenal glands) are less favorable to treatment. In cases of Rothmund's sclerodermia and cataract, chronic tetany may suggest the use of A. T. 10. Sympathectic operations may be considered. The literature reports improvement in 70 per cent of a series of 25 patients. The results of parathyroid removal are either very uncertain or completely negative in Paget's, Reynaud's, and Dupuytren's diseases, osteomalacia, osteopsathyrosis, progressive muscle atrophy, Parkinsonism, progressive myositic ossificans, and Basedow disease. The cause of the decrease in parathyroid function is important. Exact anatomical knowledge with special regard to atypical location is a prerequisite for parathyroid surgery.

The most important guides are both inferior thyroid arteries. Indirect methods, i.e. extracapsular unilateral extirpation of the thyroid gland, ligation or resection, and the phenol painting of the internal thyroid arteries, are not acceptable. X-ray treatment is not useful. Such treatment may be dangerous, as could be observed in a case of severe tetany in which ten years later the X-ray treatment of the thyroid gland was found to be responsible for late damage of the parathyroid vessels. Roentgen irradiation of the hypophysis as a governing organ of the parathyroid gland gave poor results. Surgery of the parathyroid glands, as an important branch of physiological surgery, has opened up doors to new fields. The author believes that physiological surgery, which has taken over the spirit of classical French surgery, must adopt the two characteristics of classical German surgery: namely, a conscientious spirit and a sense of criticism, in order to make further progress.

(L. Zukschwerdt). Noah D. Fabricant, M.D.

Grodinsky, M.: Retropharyngeal and Lateral Pharyngeal Abscesses. *Ann. Surg.*, 1939, 110: 177.

Acute retropharyngeal and lateral pharyngeal abscesses are secondary to infection of the nose, throat, or middle ear. They are more common in young children under the age of three years. This may be due to the greater abundance of lymphatic vessels in that age-period. The common pyogens are usually the responsible organisms.

The infection reaches these spaces by direct continuity, venous or lymphatic drainage, the latter being most common except when trauma is a factor, in which case the spread is by direct implantation. Acute retropharyngeal abscess may involve the space between the pharyngeal wall and the visceral fascia (visceral space), the space between the visceral and alar fasciæ (Space 3), or the space between the alar and prevertebral fasciæ (Space 4). Infection in the visceral space is apt to remain localized at the

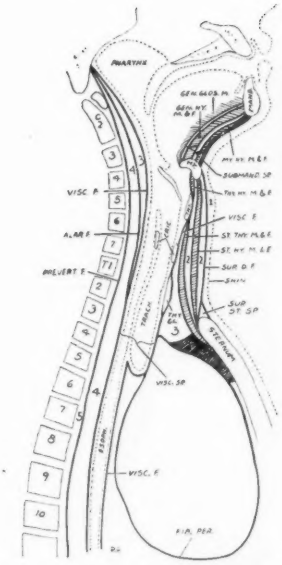

Fig. 1. Diagrammatic drawing of fasciæ of head and neck in midsagittal section.

site of origin. Infection in Space 3 may remain localized at the site of origin, but may also spread inferiorly and laterally through the neck to the superior mediastinum. It may also break through the alar fascia and reach Space 4. Infection in Space 4 (the danger space) is apt to gravitate through the neck into the posterior mediastinum. The lateral pharyngeal space is directly continuous with Space 3. It may be primarily infected from the lateral pharyngeal wall or may be secondarily in-

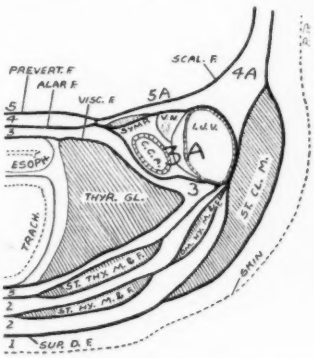

Fig. 2. Diagrammatic drawing of fasciæ of neck. Transverse section approximately at the level of the sixth cervical vertebra.

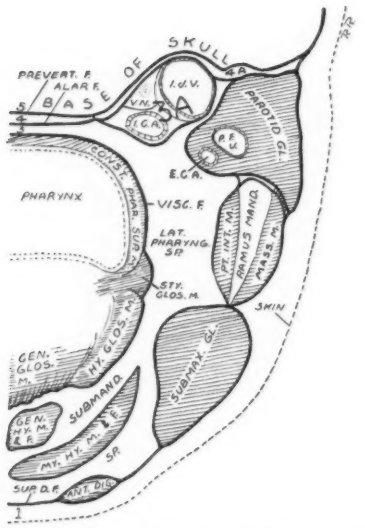

Fig. 3. Diagrammatic drawing of fasciæ of the head and neck. Oblique anteroposterior section showing the relation of the submandibular space to the lateral pharyngeal space and Spaces 3 and 4. (Courtesy of J. B. Lippincott Co.)

KEY TO ABBREVIATIONS ON ILLUSTRATIONS

ALAR F.—Alar fascia. AX. SP.—Axillary space. ARYT.—Arytenoid cartilage. A. AOR.—Ascending aorta. AZ. V.—Azygos vein. BR. PL.—Brachial plexus. CLAV.—Clavicle. COROC.—Coracoid process. CRIC.—Cricoid cartilage. C. C. A.—Common carotid artery. CONST. PHAR. SUP. M.—Superior pharyngeal constrictor muscle. D. AOR.—Descending aorta. D. D. PECT. F.—Deep layer of deep pectoral fascia.

fected from Space 3, the parotid space, the masticator space, or the submandibular space. *Vice versa*, primary infection within the lateral pharyngeal space may spread secondarily into those spaces. Infection in the lateral pharyngeal space extending into the submandibular space may resemble Ludwig's angina in the later stages. Chronic retropharyngeal abscess is practically always due to tuberculous caries of the cervical vertebræ. It is usually confined to Space 5 behind the prevertebral fascia, and usually gravitates to lower levels along muscles taking origin from the vertebral column (psoas abscess). It may, however, remain localized in the cervical region, in which case it may rupture through the alar fascia and enter "danger space" 4. It is more common in adults. The clinical picture of pain, difficulty in swallowing and speaking, chills and fever, internal bulging of the pharyngeal wall, and external swelling of the neck should make early diagnosis possible.

The treatment is chiefly surgical—early and adequate drainage. This may be internal through the mouth for cases confined to the posterior pharyngeal region (visceral space and Space 3). External incision is necessary for collections in the lateral pharyngeal space or inferior extensions in Spaces 3 or 4. The "T" incision of Mosher with reflection of the submaxillary salivary gland is especially applicable for collections in the lateral pharyngeal space. Spaces 3 and 4, including collections in the superior mediastinum and posterior mediastinum above the fourth thoracic vertebra, may be effectively drained by a cervical incision anterior to the sternocleidomastoid muscle (collar mediastinotomy). The presence of such collections in the posterior mediastinum below the level of the fourth thoracic vertebra demand posterior thoracic drainage (dorsal mediastinotomy).

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THE TREATMENT OF FACIAL PARALYSIS

Collective Review from 1932 to 1938

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A REVIEW of the literature from 1932 to 1938 has revealed that in these years there has been a steady increase in the trend toward early surgical treatment in facial paralysis of the peripheral type. When the paralysis is due to tumors or lesions in the posterior fossa, the attack on the lesion is, of course, dependent upon the type of lesion present. This review is limited to treatment of facial nerve lesions within the facial canal or after the nerve has exited from the stylomastoid foramen. The treatment is then dependent upon the factor producing the paralysis. Such treatment is classified as non-surgical or surgical. The non-surgical treatment has consisted of physical therapeutic measures, including facial splinting, massage, electrotherapy, and diathermy. There are a few reports of some improvement following x-ray treatment over the course of the facial nerve.

The surgical treatment may be subdivided into decompression operations, nerve suture, nerve grafts, nerve anastomoses, plastic operations, and cervical sympathectomies.

In regard to the physiological anatomy of facial-nerve paralysis, Cardwell (14, 15) emphasized the importance of localizing the lesion according to the symptoms. A careful examination should be made in all cases of facial paralysis to determine the exact point of the lesion. Lesions below the stylomastoid foramen produce a complete facial paralysis without tinnitus or paracusis. In these cases, hearing is normal and there is no sensory disturbance of the tongue or palate. Lesions in the lower facial canal result in loss of taste over the anterior two-thirds of the tongue and also cause a diminished salivary secretion. Lesions higher in the fallopian canal, but below the geniculate ganglion, result in facial paralysis and loss of taste in the anterior two-thirds of the tongue and hyperacusis. A lesion in the ganglion causes complete facial paralysis, loss of taste, diminished salivary secretion, hyperacusis, paralysis of the palate, pain, and herpes. The lacrimal secretion is also diminished and may be the cause of serious eye complications. When the lesion is above the geniculate ganglion, there is paralysis of the face, diminished salivary secretion, hyperacusis, and normal taste. Still higher, there is loss of hearing and labyrinthian reactions from the involvement of the eighth nerve. When the lesion is within the posterior cranial fossa, these symptoms are accompanied by signs from other cranial nerves.

Ballance and Duel (6) created interest in direct repair of the nerve within the facial canal, by either a nerve graft or nerve suture, when they reported remarkable recovery from facial paralysis after insertion of a nerve graft within the facial canal in animals and in patients. They performed a series of operations on baboons, consisting of nerve anastomosis between the facial and the adjoining neighboring cranial nerves, direct nerve sutures, and nerve grafts between divided ends of the facial nerve. In the grafts, they used various nerves for the interposing segment and concluded that similar results were obtained from all nerves —that it made no difference whether a motor, sensory, or mixed nerve was used.

Both Ballance and Duel, in their joint and separate reports (4–6, 23–28), admitted that anastomosis operations might result in good motor function of the muscles innervated by the facial nerve, but that return of power to these muscles was greatly handicapped by the always-resulting associated movements. Ballance (4) stated that it is unnatural to unite one nerve to another when it is possible to unite the divided ends of a nerve with a nerve graft. In their earlier reports, Ballance and Duel favored the use of the external respiratory nerve of Bell for a nerve graft. Duel (26, 28) later abandoned the use of Bell's nerve and chose instead a femoral cutaneous nerve, the loss of which resulted in only a slight sensory loss. He believed that a nerve which had been allowed to degenerate for two or three weeks allowed for more rapid and complete recovery than a fresh graft. The reason given for this was that in the prepared graft the axons were degenerated, which left the tubes or spaces through which the downgrowing axons from the central end of the facial nerve could easily grow. In the fresh graft, the products of degeneration might interfere with the growth of the new axons through the graft. The technique advocated by Ballance and Duel was to perform a mastoidectomy and remove the

outer wall of the fallopian canal to expose the facial nerve within its bony route. After this exposure of the nerve, the destroyed segment could be removed and the ends freshened. A segment of nerve or nerve graft was then placed in the canal, in close apposition to the divided ends. They stated that suturing was unnecessary. Great care was used to see that no blood gathered between the ends of the graft and the facial nerve. They believed at first that a dry wound was necessary for successful union between the nerves, but they later modified this opinion and concluded that a small amount of blood around the nerve junction tended to seal the union in place. Great care was used, however, to see that no blood gathered between the ends. After the nerve graft was inserted, it was covered with dental gold foil and the wound was packed without sutures. The wound was dressed daily without disturbance of the gold foil. Warm, saline irrigations would remove any débris, and healthy granulation tissue soon covered the entire graft. After about two weeks, the gold foil could be removed with safety. At this time, the graft was completely buried in healthy granulation tissue. In regard to the presence of infection within the wound, they believed that the presence of infection did not prevent successful union of a graft. They would instill such a graft even in the presence of pus. Bunnell (11) was vigorously opposed to this statement and stated that, in his opinion, infection was an absolute contraindication to nerve repair, either by graft or by end-to-end suture. He advocated waiting until all infection was absent before an actual repair be performed. Duel (27) reiterated the statement, made by both him and Ballance, that although anastomosis of the facial nerve with other cranial nerves may allow return of function of the involved muscles, emotional movements do not return, and that the voluntary movements are usually accompanied by associated movements. The experimental evidence that they had accumulated demonstrated that the use of autoplastic grafts of any length, whether reversed or unreversed, would restore function of the injured facial nerve and that, moreover, this method of repair eliminated the associated movements which resulted from nerve anastomosis. At the same time emotional facial expression was regained. Facial nerve lesions in 35 patients were found to average 20 mm. in length. When a short graft was required, Bell's anterior respiratory nerve was used. When the lesion required a graft longer than 15 mm., the use of Bell's anterior respiratory nerve was out of the question. The anterior femoral cutaneous nerve was then used, since the experimental work had demonstrated that sensory nerves were as efficient as motor nerves. Duel again reported that the presence of suppuration was not a contraindication to the employment of nerve grafts, and that the field surrounding the nerve graft need not be free of bleeding. Heteroplastic grafts could be used with entirely satisfactory results in patients with the same blood grouping.

In regard to the non-traumatic, refrigeration, or toxic type of paralysis, known as Bell's palsy, the majority of patients, or roughly, 80 per cent, showed a complete recovery within six to eight weeks. In those cases in which recovery was so incomplete as to leave a disfigured face, Duel recommended decompression of the nerve and splitting of the perineural sheath. He found that the experimental animal regained complete facial function more rapidly and more completely if the nerve sheath were split after the nerve had been subjected to such insult as freezing it with ethyl chloride. He also found that every case of long-standing facial weakness following Bell's palsy would show improvement after the sheath of the nerve had been split. He advocated this procedure in all patients who did not recover within several months. In 1936, in a discussion of his previous work, Duel (27) emphasized the importance of experience on the cadaver before any surgery on the facial nerve is done. At this time, he stated that while the end-results of direct facial-nerve repair were more satisfactory than those obtained by any other method, they were never perfect. There always remained some dissociation of movement because the new-forming axons often divided to innervate more than one muscle. In this way, the cell of origin, which originally would evoke muscular response from one muscle, would produce reactions in all the muscles to which the divided axon had grown. Because of this, he stated that muscle re-education was an important adjunct in the treatment.

According to Sullivan (67, 68), the labyrinthian segment of the facial nerve is not accessible to injury during mastoid surgery, but the pyramidal segment, including the tympanic and mastoid segments, may be injured if great care is not used in the radical operation. When a facial paralysis follows as the result of a mastoidectomy, the nerve should be exposed immediately. He states, "It is much better to explore and determine immediately the nature and extent of the injury than to be harassed by uncertainty." Decompression can easily be performed if the nerve is swollen. If, however, the nerve is torn or partially destroyed, a nerve graft, as recommended by Bal-

lance and Duel, should be performed. Prepared, degenerated grafts of two or three weeks' duration, taken from the anterior femoral cutaneous nerve, are used for the implants. He cites 2 cases to illustrate the complete recovery that can be obtained through this method.

In a paper praising the work of Ballance and Duel, Graham (33) reported 1 case of facial paralysis following surgery on the external ear and antrum, in which re-operation was done eight months later. The entire canal was opened and the facial nerve was found to be macerated within the canal. The ends of the nerve were teased together after the nerve was freed. The patient had a remarkable degree of recovery within eight months. A second case was described in which perfect recovery followed decompression of a nerve that had been paralyzed for two years. The author believes the time of operation is unimportant, but that a careful, physiological study to determine the exact site of the lesion is important. In discussion of this paper, Bunnell (11) advocated waiting until a clean wound is present before any reparative surgery is performed. He also advises against the use of strands of silk or catgut to bridge nerve gaps. Recovery is dependent upon careful approximation of the nerve ends and the use of nerve grafts when necessary. When nerve grafts fail, the use of temporal-muscle and masseter-muscle nerve transplants is the method of choice.

Foster (30), in paying tribute to Ballance and Duel, described 2 cases of facial paralysis following mastoidectomy. In one, complete recovery followed decompression of the nerve with incision of the nerve sheath. In the other case, two strands of the internal, cutaneous nerve from the forearm were bridged between the nerve ends with resulting return of motion to the face. The frontalis muscle, however, remained paralyzed.

According to Tickle (71), the recovery in operations for facial palsy is dependent not only upon the technique but also upon the after-care and treatment. The canal of the external ear should be thoroughly cleansed and sterilized. This is done by filling the external auditory canal with 3 per cent iodine and leaving it in place for four minutes. The iodine is then sucked out by means of a medicine dropper, following which, two installations of 95 per cent alcohol are made. The canal is then washed out with sterile salt solution. Accidental paralysis should be explored at once and the nerve identified by faradic stimulation. The nerve is exposed in the canal from the stylomastoid foramen, past the point of injury. In Bell's palsy, the nerve sheath is split and the wound covered immediately with gold foil. When the wound is left open, as in accidental cases, and when grafts are used, the nerve is covered with sterile dental gold foil. The wound is left open, lightly packed with sterile gauze which has been soaked in sterile, saline solution, and is covered with perforated rubber tissue to prevent adherence of the dressings to the flap. In regard to the placing of the nerve graft, care must be used to prevent blood from accumulating between the ends. However, bleeding around the ends tends to seal it in place. In the after-care the dressings are changed daily and suppuration is removed by saline irrigation. Galvanic stimulation of the facial muscles once or twice a week helps maintain muscle tone. Tickle believes that operation is contraindicated in those cases in which muscles do not react to galvanism.

Smith (65) advised decompression of the facial nerve within the fallopian canal when facial paralysis follows mastoidectomy. He performed a decompression two years after a radical mastoidectomy had been performed, and the patient regained 70 per cent of the facial-nerve function. A second case obtained complete recovery following decompression after a simple mastoidectomy. According to Morris (48), the facial nerve should be decompressed in Bell's palsy if no recovery occurs in from six to eight months. Morris cites 12 cases illustrating his viewpoint.

Craig (17) recommends conservative treatment in Bell's palsy for at least six months. During the period of paralysis, the eye should be protected and the muscles of the face splinted to prevent overstretching. He believes that a good index as to the advisability of surgery can be determined by electrodiagnosis. In cases requiring surgery, particularly the accidental type, it is advisable to suture the nerve if possible. If this is not possible, hypoglossal facial or spinofacial anastomosis combined with a cervical sympathectomy is probably the treatment of choice. A cervical sympathectomy provides some degree of protection to the eye, in that the fissure is narrowed and enophthalmos develops.

Ellis (29) advises decompression of the facial nerve in Bell's palsy if no recovery takes place in eighteen months. When facial paralysis follows operation on the mastoid, an autoplastic graft, as recommended by Ballance and Duel, should be instilled if no recovery takes place within a reasonable time. The graft must be inserted before muscular reaction to galvanism is lost. Duel repeatedly emphasized the value of decompression in about 20 per cent of the cases of the toxic or refrigeration type of Bell's palsy. He states that

if this 20 per cent were properly treated by decompression at the opportune time, the incidence of permanent facial weakness would be greatly lessened.

Hutchison (43) reports a case of facial paralysis following mastoidectomy. A second operation was then performed and the facial canal was opened. The nerve was found to be damaged and partially torn. The nerve was realigned and sutured with fine catgut sutures through the perineurium. The patient was then given electrotherapy massage, elastic support for the face, and exercises to be performed in front of a mirror. The final outcome was one of almost complete recovery.

Sander (60) describes 2 cases of facial paralysis "A Frigore," which were cured by decompression, and states, "Inflammation of the middle ear, acute or chronic, may be accompanied by congestion and, possibly, by infection of certain groups of mastoid cells around the fallopian aqueduct associated with periostitis or osteitis of the latter, thus producing perineuritis and neuritis of Bell's nerve. Alternately there may be oedema of the neurilemma with compression of the nerve in the narrow and unyielding fallopian canal. Severe infection is not necessary for the production of these lesions; catarrhal otitis of a very mild degree may cause them. Atypical, abortive or latent forms of otitis, forms which may not be discovered by clinical examinations, may well be the cause of facial palsy." He believes that a decompression should be performed early if recovery does not begin a few days after the onset of the paralysis.

Tumarkin (74–76) questioned 150 patients who had had Bell's palsy, and found that 1 of 5 showed incomplete recovery, varying from weakness of a single muscle to complete unilateral facial paralysis. In analysis of the initial symptoms and degree of recovery, he noted that if pain and loss of taste were present, the chances were two to one against complete recovery, but if neither of these were present, the chances were twenty-five to one that recovery would be complete. Consequently, he considered these findings a valuable sign in determining whether or not decompression should be performed early. Because the facial nerve is accompanied in the canal by an artery and vein, Tumarkin believes that swelling of the nerve obliterates the vein by compression, with the resulting venous stasis. Obliteration of the stylomastoid artery results in a vascular decompression, which enables the vein to function. To counteract the vicious venous stasis in the canal, Tumarkin performs a simple mastoidectomy and removes the perifacial cells and the posterior meatal wall to ablate the stylomastoid artery as it emerges from the canal. He also removes the outer attic wall to diminish tympanic congestion. He states this operation is simple and safe and is advisable when the criteria against recovery, namely, pain and the loss of taste, are present. He cites 1 case of facial paralysis with herpes oticus with marked recovery within an hour after the operation. In regard to those cases of incomplete recovery from Bell's palsy with profuse tearing, he states (73) that treatment is difficult at best and that excision of the lacrimal gland may be warranted. The accessory lacrimal glands will prevent xerosis.

Tempea (69) advised that all cases of facial paralysis "A Frigore" should be examined by an otologist, and if evidence of infection is present, surgery should be performed. He believes that recovery will be greatly aided by this procedure and cites 5 cases illustrating his viewpoint.

Verbrugghen (77) recommends conservative treatment for two or three months in Bell's palsy and then, if no recovery is taking place, he advises decompression of the facial nerve. Massage and electrical stimulation are given as soon as the acute stage is passed, to maintain muscle tone. He believes the nerve should be decompressed as soon as a facial paralysis is discovered in mastoid disease. When due to operative trauma in the temporal bone, the nerve should be decompressed immediately, even though an autoplastic transplant may be necessary at a later date. When facial paralysis follows a skull fracture, no surgery should be performed during the first six months, in which time nearly all cases show complete recovery. In those cases with permanent paralysis following skull fractures, spinofacial or hypoglossal facial anastomoses are advisable. When the nerve is destroyed outside of the skull, an autoplastic graft should be used.

Bunnell (11) draws attention to the phylogenetic function of the facial nerve and illustrates how important the function of taste, the secretory function for salivation and tears, and deep visceral sensibility are in the lower animals, whereas emotional facial expression is very minor. In man, facial expression is of extreme importance. He emphasizes the need for a careful determination of all the functions of the facial nerve in making a localizing diagnosis for a lesion. In a facial-nerve injury complicating a mastoid operation the lesion may be located anywhere between the geniculum and the chorda tympani but is usually in the vertical portion just below the bend where the nerve often bows outward and may be sur-

rounded by mastoid cells. Therefore, when one curettes and searches too low for the attic or when one curettes away the bridge, the nerve may be torn apart, or a segment of it may be lost. In Bell's palsy, swelling of the nerve produces an ischemia, with a resulting necrosis over the length of the nerve. The nerve compression or necrosis is usually in the most distal part of the canal. Decompression of the nerve would be a cure in all cases if done immediately and properly. Eighty per cent of the patients, however, recover spontaneously and, if all patients were operated upon, 80 per cent of the operations would be unnecessary. Bunnell believes that if recovery does not take place within six months, surgical repair is indicated. Decompression may result in improvement even though performed long after the lesion has occurred.

Persky (52) recommends decompression of the facial nerve within the canal when facial palsy complicates suppurative otitis media. In the acute and simple cases, simple mastoidectomy only is indicated. When facial palsy follows the mastoidectomy, the nerve should be exposed immediately and treated in accordance with the pathology found. When the nerve is swollen, splitting of the sheath will usually suffice. When there is a loss of nerve substance, an autoplastic graft should be performed. The prognosis is somewhat dependent on the duration of the palsy, and the earlier it can be treated, the better will be the results.

Bunnell (11) states that intratemporal repair of the facial nerve is the method of choice in destructive lesions of the facial nerve. Anastomosis of the peripheral end of the facial nerve with neighboring cranial nerves is obsolete in that associate movements occur and emotional facial expression never returns. The first successful suture of the facial nerve intratemporally was reported by Bunnell in 1927. His second case, treated by operation in 1928, three years after the original lesion occurred, was followed by a sloughing of tissue and an unsuccessful operation. In 1930, he bridged a 2½ in. gap in the facial nerve by a three-branched graft from the sural nerve. Facial symmetry was established in eight months, and voluntary motion was present in the entire face, with the exception of the frontalis and platysma muscles, within seventeen months. This, according to Bunnell, was the first successful facial nerve graft performed. He reports a fourth case with marked recovery following re-routing and suturing of the facial nerve ends. The operation which Bunnell recommends for repair of a facial nerve gap is re-routing of the nerve and an end-to-end suture. By re-routing a distance of 23 mm. can be gained. The operation is performed by extending a mastoid incision well down the neck, paralleling the flexion crease. The facial nerve is located as it exits from the stylomastoid foramen. Here it is 1 in. deep and directly under the lobule of the ear. After the nerve is encountered exiting from the stylomastoid foramen, it is uncovered from below, upward, by careful chiseling away of the mastoid process. The nerve lies ⅞ in. deep in the bone and therefore a channel wide enough to work in freely is uncovered. After the lesion has been found, the nerve is re-routed from a bending route to a straight one. If the vaginal process and tympanic plate of the temporal bone are chiseled away, the nerve can be re-routed directly from the parotid gland without angling at the stylomastoid foramen. In this way, 1 cm. can be gained. Freeing the nerve into the parotid gland, and displacing the parotid gland upward and anchoring it to the digastric muscle, will add 6 mm. If the lesion is in the geniculate ganglion, an additional 7 mm. can be gained by re-routing directly from the parotid gland to the geniculate ganglion. When the gap is too great to be overcome by re-routing, a free nerve graft is advisable. For this purpose, Bunnell uses a sural nerve. He believes that small nerves used for grafting purposes are more successful than large nerves because nourishment of a small graft is more easily maintained in the surrounding lymph than that of larger nerves. In regard to the technique of attaching the nerve ends, he strongly emphasizes the importance of careful suturing with the finest possible needle and silk. The success of the operation is proportional to the accuracy of the union. Infection, free blood, or granulation tissue will greatly detract from the accuracy of healing, and nerve sutures should not be attempted in the presence of free bleeding or infection.

When it is impossible to repair the facial nerve, a plastic operation should be done. This operation consists of swinging portions of the temporal and masseter muscles forward to the muscles of the face, where they are attached by multiple fascial grafts. A portion of the temporal muscle is swung forward and three fascial grafts are attached to the orbicularis oculi of the upper lid, and one to the lower. A second portion of the temporal muscle is then attached to the muscles about the upper lip and nose by four fascial transplants. A portion of the masseter muscle is attached to the muscles of the upper lip, and a second portion, to the muscles of the lower lip by fascial transplants. A diagram illustrating this method is shown in the article.

Eight cases are cited illustrating Bunnell's method of facial repair, marked improvement resulting in all but 1. In the 1 case of failure, tissue sloughing prevented return of function. In a discussion comparing the various methods of treatment of facial paralysis following mastoiditis, Sanger (61) recommends the procedure advocated by Bunnell.

Davis and Cleveland (18) describe 5 cases showing marked improvement in appearance and muscular control following spinofacial and hypoglossal facial anastomosis. Constantini and Curtillet (16) performed a bilateral spinofacial anastomosis and a bilateral section of the superior cervical ganglion in a patient who had no recovery in six months from a bilateral facial paralysis following a skull fracture. The operation was performed in four stages and the final result was extremely gratifying in that the face lost its flat toneless, paralyzed appearance, and volitional movements returned in the face. Photographs showed the end-results in this case.

Sewall (62) describes 2 cases of facial paralysis complicating mastoid disease which showed no recovery after decompression of the nerve. The first case was treated by operation one month after the onset of the paralysis which followed a secondary mastoidectomy. This case showed no recovery within five months after the decompression. A second case showed no recovery three months after decompression of the facial nerve. In this case, the facial paralysis came on nine hours after a simple mastoidectomy had been performed, and a decompression and opening of the sheath was performed twelve days later.

According to Dintenfass (21), the facial paralysis occurring early in the course of an acute otitis media is a relative indication for mastoidectomy. The operation is not indicated unless other symptoms demand it. Facial paralysis occurring late in otitis media is an indication for mastoidectomy. Terracol (70) believes that facial paralysis in association with otitis media is an indication for surgical intervention. Hilding (40) performed a radical labyrinthectomy and opened the dura and the posterior fossa medial to the sinus. Twenty-seven days later, the patient developed a facial paralysis, and when the wound was re-opened, a sequestrum of bone involving the facial canal was found and removed. The patient made a complete recovery within nine days.

Hirsch (41) classified facial paralysis and otitis media according to the stage of development and the complicating factors. From this classification, he draws the conclusions that (1) facial paralysis which develops early in the acute stage of otitis media is not an indication for mastoidectomy but, instead, for myringotomy; (2) when facial paralysis develops in the third or fourth week of the acute, purulent otitis media, it may be an indication for mastoidectomy; (3) facial paralysis in chronic, purulent otitis media, without cholesteatoma, may be an indication for mastoidectomy if other reasons exist; (4) facial paralysis in chronic, purulent otitis media with cholesteatoma is an indication for mastoidectomy; and (5) facial paralysis, originating in pre-existing chronic, purulent otitis media, with acute labyrinthitis, may be an indication for labyrinthectomy to prevent threatening meningitis.

Many cases of facial paralysis are so complicated by a sufficient loss of the facial nerve that repair of the nerve is impossible. When this is the case, plastic operations to overcome the deformity should be performed. Halle (34–37) recommends direct nerve suture or nerve grafts, as proposed by Ballance and Duel, when possible. However, when nerve repair is impossible, he believes that muscle nerve implants, from the temporal and masseter muscles, should be made to correct the deformity. In his earlier reports (34), he recommended the Rosenthal modification of Lexer's operation. This operation consisted of detaching a portion of the masseter muscle from the mandible and swinging it forward to the angle of the mouth. Here, it was split again into two portions, part of it being sutured to the circumoral muscles of the upper lip, and the rest, to the muscle of the lower lip. A small eighth-moon wedge of tissue was removed just lateral to the lip, to overcome the skin stretching that had taken place. To correct the upper facial paralysis, including paralysis of the orbicularis oculi and frontalis muscles, the anterior third of the temporal muscle was detached from the temporal bone and swung forward in three segments. The medial segment was attached to above the eyebrow to the frontalis muscle, the middle segment to the upper portion of the orbicularis oculi, and the anterior segment to the lower portion of the orbicularis oculi. To overcome the skin and subcutaneous stretching that had taken place during the paralysis, a small wedge of tissue was removed from under, and just lateral to, the lower lid. In later reports (38), Halle modified this operation because he believed it to be somewhat unphysiological, in that the temporal muscle pull was not in line with the origin of the muscles. His modification consisted of swinging muscle strips from the temporal muscle downward from the temporal plane, and using the ends of insertion for transplantation in the frontalis and orbicularis muscles. In this manner, there is a true lifting of these parts by the muscle

contractions and, according to Rosenthal, re-innervation of paralyzed muscles takes place through the nerve fiber of the transplanted paralyzed muscles.

In regard to the use of muscle implantation which Sheehan (63, 64) calls the muscle-nerve graft, he states, "Incidentally to the employment of pedicled strips from the temporal muscle to correct the functional disturbance (lagophthalmos) associated with unilateral facial paralysis, it has been ascertained that there comes to be, in time, a complete organization of the strands of the overlying muscle graft with those of the base upon which it is placed. This is accompanied by such penetration as assures to the paralyzed tissues permanent re-animation from the fifth nerve. The functional reactions, in the closing of the upper eyelid, is identical with that normally derived from the seventh nerve. With this history, the muscle strip is seen to be, in fact, a muscle nerve graft. . . . Restoration of function is, of course, the concern of major importance. There are only two possible ways of replacing the absent nerve current upon which function depends. One is to reanimate the facial nerve at its root. The other is to reanimate the local muscles, and these are at the farthest removed from the nerve root."

In defense of the muscle-transplant operation, Pickerill (53) states that while the use of temporal and masseter muscle grafts never results in a perfectly controllable face in facial paralysis, it does result in considerable improvement. The end-results are better than those obtained in other operations, the advantages being: (1) the face is stabilized to a considerable extent, having two tonic muscles on the paralyzed side to oppose those on the normal side, (2) the patient regains the power of closing the eye on the paralyzed side, which eliminates the danger of conjunctivitis and corneal ulceration, (3) there is marked improvement in the psychic and mental attitude of the patient, and (4) the voluntary closing of the eye and contractions of the mouth, after constant practice, became almost automatic.

Sheehan (64) feels that long-standing facial paralysis may be accompanied by such extensive atrophy and fibrosis that re-animation of the seventh nerve may be futile. Muscle-nerve grafts, however, bring about restoration of function through the muscle strip implants and, seemingly, through actual innervation of the paralyzed, atrophied muscles. The lagophthalmos is corrected at once by muscle strips to the eyelids. Also, facial symmetry is improved immediately.

The technique of the operation is to turn a thin strip of temporal muscle, with its nerve and blood supply intact, across to the orbicularis oculi of the upper lid and a smaller strip to the lower lid. The strips are sutured close to the edge of the lid and at the inner canthus. A muscle strip is then passed under the skin to the muscles at the angle of the mouth and sutured to these muscles. The zygoma is grooved to allow room for the muscle strip so as not to cause a bulging of the skin at this point. A third strip is then passed to the frontalis muscle for re-animation of this muscle. Illustrations of the operative procedure, and pre-operative and postoperative photographs of a patient, showing a very satisfactory result, are included in the article.

Rebattu and his associates (55) analyzed facial paralysis following injury to the skull, and concluded that facial paralysis immediately following an injury is probably due to the trauma. When it occurs several hours after the accident, it is probably due to hemorrhage, but when it is delayed for several days, it is usually due to a secondary infection. They describe a case in which facial paralysis occurred fifteen days after the patient received a basal skull fracture. A complete return of function resulted after a mastoidectomy was performed.

Hjelmman (42) advocates the muscle plastic operation of Lexer and Rosenthal in irreparable facial nerve lesions, but he believes that a cervical sympathectomy, to help correct the lagophthalmos, should be performed in combination with the muscle plastic procedure. Babbitt (3) was able to obtain marked improvement in 2 cases of facial paralysis of long duration by performing the muscle plastic operation. He believes that this operation is indicated in otherwise irreparable facial-nerve lesions. Doroshenko (22) describes 14 cases of from six months' to eight years' duration, which were markedly improved after autoplastic muscle transplants of the Kirchner type had been performed.

Brooke (10) states that treatment of facial paralysis is difficult and taxes the ingenuity of the surgeon. Nerve anastomoses are difficult, and the resulting associated movements tend to spoil the otherwise good results. Cervical sympathectomies, to enable closing of the eye, have no effect on the facial symmetry. He advises the use of fascia lata strips, similar to the operation described by Passot. This operation consists of threading a $\frac{1}{8}$ in. strip of fascia on a probe and passing it from the temporal region in the subcutaneous tissues, to the tissues beneath the skin of the upper eyelid. It is then passed around the inner canthus of the eye under the skin of the lower lid and back to the temporal region, where

it is again anchored. A second fascial strip is passed from the temporal region to just lateral to the angle of the mouth. It is then anchored around the muscle and fascia at the angle of the mouth and brought back to the temporal region where the ends are tied around the zygomatic muscle. The drooping of the mouth is slightly overcorrected to allow for some fascial stretching.

Wardill (79) used 4 fascia lata strips to suspend the drooping face and mouth muscles, and to narrow the widened fissure of the eye, with very satisfactory results, in a case with an irreparable nerve lesion.

Gillies (32) believes that in all cases of facial paralysis, fascial support is advisable. He advises nerve grafting when there is response to galvanism. The operation described by Gillies has a purely palliative effect, similar to a cockup splint in a radial-nerve paralysis. The operation consists of removing long, thin strips of fascia lata, either by the open method or by means of a ring stripper and fascia cutter. In this second method, a small incision is made above the knee to expose the fascia and then the ring stripper is applied to obtain a long narrow strip of fascia. The loops of fascia lata are then passed around the facial muscles at one or more of the following points: (a) the center of the lower lip, (b) the corner of the mouth, (c) the center of the upper lip, and (d) the palpebral fissure. The Blair type of fascia needle is used for passing the loops around the muscles. It is advisable to embrace the fibers of the nonparalyzed muscle of the upper and lower lips. In the first series of cases, separate loops were passed to each point and then fixed to the fascia in front of the ear. This operation can be performed through short incisions.

A convenient method of supporting the lip is to pass a loop to the center of the upper lip and one to the center of the lower lip and to fix these loops at one point at the angle of the mouth. From this point another loop can be passed to the point of fixation. Gillies, in one series, passed the fixing loop around the zygoma, but in a later series, he fixed the loop to the fascia over the temporal muscle in order to pull the mouth upward and backward to simulate a normal appearance. The fascia was fixed by means of silk or catgut sutures.

Activation of the face by attachment of the fascial loop to a flap of temporal muscle is considered advisable and possible, but it is doubtful that one is able to gain emotional control of the facial muscles, especially under any stress. There may be a disfiguring bulge, because of the bulk of the temporal muscle flap in the zygoma. To counteract this, Sheehan (64) advocated the formation of a groove in the zygoma to accommodate the muscle bulk. The deep layer of the muscle bulk with its nerve supply intact is separated from the superficial layer of fascia. The deep layer, which forms the sheath of the muscle, is kept intact. The raw surface of the muscle is covered with fascia lata. In this way the muscle belly is encircled with a fascial sheath, which is pulled down into the prepared prezygomatic groove and attached to the stay-loop that encircles the paralyzed, circumoral muscles. During the World War, Gillies used spring cartilages to encircle the palpebral fissure, but with rather meager results. He also used fascial loops, passed from the forehead under each lid to the inner canthus. When they were attached to the frontalis muscle, a definite lift to the lower lid was obtained for protection of the eye. However, he obtained more satisfactory results with the use of the temporal muscles and fascia. A flap of muscle, with a considerable amount of fascia, was cut far forward, and one strip passed to the upper lid and one to the lower lid, the two meeting at the inner canthus. The strips were fixed to the periosteum medial to the inner canthus. The purpose of this procedure is to produce a squeezing together of the eyelids by contraction of the temporal muscle. Careful pre-operative preparation of the tissues and painstaking aseptic precautions during the operation are necessary to prevent infection. Hematomas often occur, and these may become infected. When serous exudation takes place, removal of the silk knot usually clears this up.

Demel (19) recommends fascial strips from the upper and lower angles of the mouth to the zygoma, in facial paralysis. Von Blaskovics (7) describes an operation to correct the lower lid droop in facial paralysis. This operation consists of the removal of a wedge of tissue from the lower lid and a narrow strip of tissue, 1 cm. lateral to the eye, extending downward for 2½ cm. from the level of the eye.

Cadenat (12) advises transplantation of the digastric muscle to the corner of the mouth when the inferior branch of the facial nerve is paralyzed. This type of paralysis frequently occurs when benign tumors of the parotid are removed. Sohma and Imamura (66) recommend transplantation of the triangularis oris muscle to correct the mouth droop in facial paralysis. They state this is a simple procedure and results in an improved appearance.

Kennon (44) devised a splint to hold the mouth in normal position and to prevent overstretching in temporary facial paralysis. This splint con-

sists of a small temporary hook, covered with rubber tubing, to which is attached an elastic strap. The hook fits in the angle of the mouth, and the strap passes in front of the ear, over the head, and is attached to a wire bent around the opposite ear. Pinkus (54) designed a prosthetic hook which is attached to a crown of a tooth. A small projection of this hook fits in the corner of the mouth and holds the mouth in normal position. The projection is barely visible in the mouth.

There are numerous reports of marked improvement in the appearance and protection of the eye in facial paralysis, following removal of the cervical sympathetic ganglion. This operation produces a Horner's syndrome with a resulting enophthalmos and narrowing of the fissure. The very disagreeable lagophthalmos of facial paralysis is often markedly improved by the sympathectomy. There seems to be little difference in the results between the removal of the superior or inferior sympathetic ganglia. Wakely (78), Wertheimer (80), Roasenda and Dogliotti (56), Roques (57), Caeiro (13), and Ostrowski (51) all report gratifying results from cervical sympathectomy.

The majority of patients with facial paralysis due to inflammation of the facial nerve will recover spontaneously without surgical intervention. It is a common belief that in these cases recovery is aided by physical therapy. Martin (46) recommends the use of external heat in some form and static-wave-current electrotherapy in Bell's palsy. The static-wave current is the main agency because of its mechanical action. One metal electrode is applied directly over the distribution of the facial nerve, and the opposing electrode in the same position on the opposite side. Moderate milliamperage (3 ma.) is used for twenty minutes. The author states that the passing of the current between the electrodes causes a contraction and relaxation of the tissues which is synchronous with the current jump. In this manner, the inflammatory products are expressed from the tissues into the lymph channels and nerve pressure is relieved. From two to four treatments will usually result in recovery if they are begun early. If the treatment is begun later than thirty-six hours after the onset of the paralysis, additional treatments are necessary. If two or three weeks elapse before the treatments are started, galvanic current must be used instead of static-wave current. The author makes a plea for early static-wave treatment.

Arwine (2) recommends the use of mild, negative galvanic current early in the course of facial paralysis, to be followed later by alternating, sinusoidal, interrupted current. He describes a case of facial paralysis following mastoidectomy, which showed marked recovery following this procedure.

According to Nicolle (50), the treatment of facial paralysis should be directed toward the cause. Mastoid infections should be operated upon, tumors should be removed or irradiated, and foci of infection and diseases should be adequately treated. In regard to electrical stimulation of the nerve, he believes that faradism is somewhat dangerous in that severe contractions may result. The author recommends the method originated and modified by Bourguinon: namely, that of using a small, negative electrode soaked in 10 per cent potassium-iodide solution placed over the point of the lesion, and a large, positive electrode, soaked in physiological saline solution or plain water, placed over the neck or between the shoulders. A current of from 2 to 3 ma. is introduced for thirty minutes daily for one week, and then three times a week until from 10 to 15 treatments have been given. The iodine is thought to penetrate the tissues and soften the scar tissue. This method is also recommended by Gauducheau (31).

Tucker (72) believes that in true Bell's palsy, the prompt institution of a blister and heat over the mastoid area aids in the reduction of inflammation of the facial nerve. He also advises the administration of salicylates and iodides, the use of adhesive splints to prevent facial sagging and, after the acute inflammation has passed, the skilled use of massage and electrotherapy.

According to Moldaver (47), the treatment of facial paralysis should be guided by careful determination of the muscle chronaxy. In those cases in which chronaxy determinations show a possibility for return of function, electrotherapy is indicated. The method advised is similar to that recommended by Nicolle. It must be remembered, however, that unless electrotherapy is properly used, more harm than good may result. Overstimulation of the muscles may produce postparalytic contractions.

Rutherford (59) recommends the use of diathermy to hasten recovery in facial paralysis, and states that the results in 75 cases which were followed were very satisfactory. His method is as follows:

The operator sits in a chair, on the seat of which has been fastened a circular, vulcanite plate, ¼ in. thick and 12 by 14 in. in diameter. This plate rests on a tin or sheet-iron base, 10 in. in diameter, which is connected to a diathermy unit.

The patient sits in an ordinary chair facing the operator, and a 5 by 2 in. diathermy plate, smeared with diathermy soap, is attached to his arm. The current is turned to 3 ma. and the operator touches the patient's arm with his hand. If the paralysis is in the right side, the operator uses his right hand, and the left hand if the paralysis is in the left side. As the operator's fingers touch the patient's arm, a sparking effect is produced. A feeling of heat is produced by the contact, the amount of heat being less if all the fingers are touching, than if only one or two are being used. The current is then turned on full from 3 ma. and, after a few moments, the operator brings his other hand in contact with the paralyzed side of the patient's face. When the patient has become used to the current, the operator's fingers are gradually lifted from the patient's arm until all the current is passing through the patient's face. The muscles of the face are then massaged from the angle of the jaw forward with a creeping or walking motion. Treatment is carried on for from ten to fifteen minutes and finished by allowing some sparking to the face. Following the treatment, the face remains flushed from twelve to twenty-four hours. Treatments are given two or three times a week and improvement usually begins within the first week. The average period of treatment is from four to six weeks, but may be longer if reaction to degeneration has set in. In addition to the diathermy massage, the following chart of exercises are given to the patient to perform at home:

1. Pull down the upper eyelid with finger, keep it closed for a second, remove fingers and try to keep eyelid closed. Repeat this from five to ten times.

2. Hold sound side of mouth closed with fingers and thumb. Try to repeat labial words (words starting with B, P, M, V, F) with affected side of the mouth.

3. Hold the sound side of the mouth and try to grip finger or pencil with lips on affected side.

4. Close lips. Suck in and blow out cheeks. (Each exercise is to be repeated from five to ten times, two or three times daily.)

Bourbon (8, 9) states that physical therapy is a distinct adjunct to the treatment of facial paralysis of peripheral origin. When facial paralysis is due to pressure from exudation as the result of hemorrhage, lymphatic engorgement, focal infection, or from neuritis due to cold or exposure, the nerve may become fibrosed and hardened unless the exudate is absorbed. Heat is an effective aid in hastening the absorption of the exudate. Diathermy gives the deepest penetration of heat, but an infra-red or radiant heat lamp may be satisfactory. Rest to the paralyzed muscles is important, and strapping and splinting of these is advised.

According to Royle (58), massage in facial paralysis should be over the mastoid area and the side of the neck from the occiput to the chin on the affected side. Massage of the muscles produces fibrosis. He believes that electrostimulation of the muscles of the face is useless. Instead, he advises the patient to attempt facial exercises with the normal side of the face held immobile. Arce (1) advocates electrotherapy in true Bell's palsy. De Munter (20) advises the use of electrotherapy massage and diathermy in Bell's palsy as soon as possible.

Hansson (39) states that in Bell's palsy local and general rest should be instituted immediately. The eye should be protected and the facial muscles splinted to prevent overstretching. Electrodiagnosis is a valuable adjunct in determination of the prognosis. If there is a reaction to both galvanism and faradism, recovery will take place in from six to eight weeks. When the reaction to faradism is questionable and the reaction to galvanism good, recovery will occur in from two to three months. When the reaction to degeneration is complete, no recovery will occur before three months and, possibly, not before one year after a sufficient period of local and general rest. Hansson recommends the use of heat, preferably infra-red, to the paralyzed side for ten minutes, to be followed by electrostimulation of the affected muscles with an interrupted galvanic current. A unipolar negative electrode is advised for stimulation of the affected muscles. This treatment is given every other day until full recovery has taken place. The patient is taught how to apply gentle massage to the affected muscles and exercise his face in front of a mirror.

New and Kirch (49) describe a clinical entity of a non-inflammatory, permanent enlargement of the lips and face, sometimes associated with unilateral and bilateral facial paralysis. In some cases the facial paralysis antedated the facial swelling by many years and was probably due to swelling of the nerve. The treatment advised by the authors was to inject boiling water into the tissues and later excise the tissues.

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SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Fischer, E.: The Angiographic Diagnosis of Compressive Intracranial Processes (Zur Artdiagnostik raumbeengender intrakranieller Prozesse im Gefaessbild). *63 Tag. d. deutsch. Ges. f. Chir.*, Berlin, 1939.

From the large field of angiographic diagnosis, three features are presented: (1) the syndrome of cerebral artery displacement; (2) the diagnosis of cerebral vascular occlusion; and (3) the significance of pathological vessel and capillary outlines. On the basis of a precise analysis of the arterial picture (*Zentralbl. f. neurochir.*, 1938, 3: 300) it is possible to draw certain conclusions regarding the presence of processes specific in locality and type simply from the displacement of vessels. The alterations of vessel configuration contribute an important diagnostic point. The speaker has already reported on the tumors of the frontal lobe and basal ganglia (*Zentralbl. f. neurochir.*, 1939, 4: 72) and enters briefly into the characteristics of the temporal lobe. Six main groups of temporal lobe tumors may be distinguished in the vessel picture. Of these, the more infrequent and extracerebral tumors give the best operative results; the frontotemporal and usual temporal-lobe gliomas are on the border-line of operability, and the true basotemporal tumors are incurable (*Zentralbl. f. neurochir.*, 1939).

The strictly basomedial glioblastomas of the temporal lobe represent an especially interesting tumor group. In the vascular picture they can be definitely recognized before operation by the form of the middle cerebral artery at its origin and the form of the carotid bifurcation, as well as by the structure of the basal vessels (Aa. perforantes) in the lateral view which is usually significant. These tumors, which give only few clinical symptoms in themselves, show a remarkable tendency toward degeneration, hemorrhage, and cyst formation in the deep central region and internal capsule area; hence, at a distance from the primary focus. They lead easily to confusion with common apoplexy, and an irrelevant anamnestic trauma is frequently advanced as their cause. The involvement of the basal arteriæ perforantes in the glioblastoma, which likewise supply the internal capsule, leads to disturbances of the blood supply in the region of the internal capsule with degeneration, hemorrhage, and cyst formation.

Such intracranial hemorrhages may be easily and clearly distinguished from the extracerebral, subepidural, and epidural hematomas. The hematomas lead to the familiar direct displacement of the peripheral cerebral vessels from the calvarium in the anteroposterior view. The speaker was able to predict pre-operatively an arachnoiditis polycystica with expansion of the subarachnoid spaces and of the interhemispheric fissure from the more irregular, wavy displacement of the cerebral vessels from the cranium, and the widening of the interhemispheric fissure (*Zentralbl. f. neurochir.*, 1938, 3: 300).

Furthermore, three groups of patients exhibited ventriculograms with the following in common: a moderately prominent hydrocephalus, a tilting of the septal plane with slight lateral deviation of the ventricles, and peripherally widened fluid spaces. The angiograms provided an explanation in all the cases. In the first, there was an obstruction of the anterior cerebral artery, in the second, an obstruction of the middle cerebral artery, and in the third, both main vessels were occluded. The majority of the patients suffer from epileptiform attacks, and in many cases, injury or overexertion at work is held responsible. It is possible that a spastic component contributed primarily to the origin of the vascular affection, but at the time of observation the changes were organic. This could also be demonstrated frequently in the arteriograms. Pictures of atherosclerosis of the basilar arteries, endangitis obliterans, and partial embolic occlusion of the cerebral vessels are given in the original article.

As far as changes in the capillary and vascular structure shown in the angiograms are concerned, the characteristic pictures of meningiomas and glioblastomas are familiar, the latter conceived by the author's teacher, Toennis, to be micro-aneurysmal structures and arteriovenous fistulas. Two years ago at the Neurological Congress in Munich (*Zentralbl. f. neurochir.*, 1938, 3: 50) it was pointed out by the speaker that among the richly vascularized gliomas, the very vascular oligodendrogliomas achieve sharp definition in the angiogram, either as negative or positive capillary tumor shadows, or through the change of the individual blood vessels supplying the growth, which break up into a fine, clearly visible vessel network. It is often difficult to distinguish these tumors from normal brain tissue. The preoperative recognition of such tumors in the angiogram, as opposed to that of the poorly vascularized and sharply limited oligodendrogliomas, is therefore of great practical significance. Astrocytomas give an indication of pathological vessel outline only in very limited instances. And only seldom will it be possible, as in 1 case of primary gastric carcinoma presented, to diagnose intracerebral tumor metastases by means of the multiplicity of changes.

(E. Fischer). O. Theodore Roberg, Jr., M.D.

Jefferson, G., and Jackson, H.: Tumors of the Lateral and of the Third Ventricles. *Proc. Roy. Soc. Med.*, Lond., 1939, 32: 1105.

This article deals only with those tumors which are unmistakably intraventricular, and these comprise five types: (1) the chorioid plexus papillomas; (2) the meningiomas of the tela chorioidea, (3) the

colloid cysts of the paraphysis (the best example of a true intraventricular tumor), (4) the epidermoids, and (5) a few gliomas which may arise from the ependyma or the extra-ependymal neuroglia around the ventricles. Pineal tumors, pituitary-anlage tumors, and gliomas of the basal ganglia impinging upon the ventricles are distinctive in their own right and are not to be considered as primarily intraventricular tumors. The five types of tumors named are illustrated by short, well selected case histories. Intraventricular ependymomas, it will be noted, have been rare in the experience of these authors.

Jefferson and Jackson are anxious to evaluate the symptoms of disturbed autonomic physiology which may occur in patients with intraventricular tumors. With the pure type of intraventricular tumor there is no reason to expect marked or "typically diagnostic" hypothalamic signs. The disturbances of function usually found in cases of true intraventricular tumor are due to hydrocephalic dilatation of the third ventricle and to impairment of the blood supply to the centers in the walls and floor of this ventricle. Disturbances so produced do not differ essentially from those seen in patients with other causes for an existing hydrocephalus or third-ventricle dilatation. Reasonable but not too much emphasis should be placed on the diagnostic value of the autonomic disturbances in a patient with a tumor of the ventricles; such symptoms often are not specifically informative and may be misleading.

The final diagnosis of tumors of the ventricles is roentgenological, ventriculography being the usual procedure. Even with this valuable aid one must exert caution in diagnosis, because of the possibility of pseudoventricular tumors, as, for instance, a partial cut-off of the third ventricle by a glioma of the optic thalamus, which may be erroneously diagnosed as an enucleable tumor, free and promising within the ventricle. JOHN MARTIN, M.D.

Gavazzeni, A.: Results of Roentgen Therapy of Tumors of the Region of the Hypophysis (Risultati della roentgenterapia nei tumori della regione ipofisaria). *Radiol. med.*, 1939, 26: 601.

Gavazzeni describes 14 cases of tumor of the region of the hypophysis which he has treated with roentgen rays and which he classifies schematically into two groups: tumors with a chiasmatic syndrome and more or less marked signs of hyperpituitarism (10 cases), and tumors with an adiposogenital syndrome (4 cases). The results from one to seventeen years after treatment were: in the first group, 4 lasting notable improvements, 2 lasting partial improvements, 2 temporary partial improvements, and 2 slight and only temporary improvements, i.e., good results in 60 per cent and failures in 40 per cent; in the second group, 1 lasting improvement and no improvement in the 3 other cases. Globally, the results were good or moderately good in half of the cases and unsatisfactory in the other half.

Béclère's method of treatment was used: irradiation of the sellar region through two temporal and two (or one) frontal ports, the fields being restricted to 8 by 10 cm.; exceptionally, nuchal and vertex ports were used. Rather high doses were given (600 to 800 roentgens per field) in a series every day or every two days, and the same series was repeated after two or three months to be then given at greater intervals, according to the clinical course of the disease. The focal distance was 40 cm. Large total doses are needed even in case of presumably adenomatous forms. A total dose of from 25,000 to 27,000 roentgens through three ports was given in 131 sittings to a patient in whom the only resulting drawback was permanent loss of temporal hair and moderate atrophy of the skin with some telangiectases. The reported observations show that the treatment does not endanger the skin or the nervous system. However, the appearance of epileptic attacks in 1 case led to suspension of the irradiations. Incidents reported by other authors did not occur in this series. In all cases, the headache was rapidly relieved. Vision was not improved in 2 certain cases of tumor of Rathke's pouch; it was variously improved in 10 cases; the general condition was better in all cases in which the result was good or moderately good.

From the analysis of statistics and the review of surgical publications it appears that the best results are obtained by surgical treatment; however, it should be noted that the statistics are those of experienced brain surgeons, who specialize in such operations, and that the statistics of excellent general surgeons show less brilliant results and a high operative mortality. While the difference between the immediate results obtained by the two methods is considerable in that with surgery there is an immediate benefit and with roentgen therapy the benefit is slow to establish itself, the difference between the late results is not as great: in fact, some roentgen statistics are equivalent to the surgical ones. Recurrences are very frequent after surgical intervention, especially and comprehensibly by the transphenoidal route, in which case nearly all surgeons recommend postoperative radium or roentgen irradiation to destroy possible remnants of the tumor. Roentgen treatment gives good results in a number of cases and is the treatment of choice in adenomatous forms in which it is at least as efficacious as surgery.

As the tumors of the region of the hypophysis vary in roentgen sensitivity, it is necessary to determine, as much as possible before the beginning of the treatment, the seat and the nature of the tumor; the best results are obtained in acidophil adenoma of the anterior lobe with symptoms of hyperpituitarism, but each case must be considered individually from the prognostic point of view. Immediate surgical intervention should be recommended in cases of rapidly progressive decrease of vision. Except in cystic forms and in those in which rapid blindness threatens, roentgen therapy should be tried in tumors of the region of the hypophysis, and it is indicated postoperatively in solid tumors of the hypophysis to prevent recurrence. Higher doses

than 600 or 700 roentgens are indicated for tumors other than acidophil adenomas; if the response to the first series of irradiations is favorable, subsequent series are repeated at intervals of some months until a presumably final good result is obtained. Prolonged clinical control is necessary. If there is no response to the first or second series of irradiations, the case belongs to surgery. RICHARD KEMEL, M.D.

SYMPATHETIC NERVES

Paliard, F., and Étienne-Martin, P.: The Surgical Treatment of Malignant Arterial Hypertension. Results and Indications (Le traitement chirurgical de l'hypertension artérielle maligne. Ses résultats—ses indications). *Presse méd.*, Par., 1939, 47: 893.

Having followed the ever-growing interest in the surgical treatment of hypertension since 1933, the authors have arrived at certain definite conclusions regarding the surgical treatment of choice.

They, as much as the rest of the world, are at a loss to explain the actual and basic physiological alterations which cause "essential hypertension." However, they, like the majority of the French investigators, prefer to look upon this condition as a humoral imbalance, and they point an accusing finger at the adrenal glands. They appreciate the implications of Goldblatt's experiments upon dogs, but they cannot accept his results as being applicable to a practical extent to hypertension in human subjects. They believe clinical experience, especially in the cases of refractory hypertension when there is no kidney damage, cannot and must not be set aside for the results of any animal experimentation.

From the wide range of operations used in Europe and the United States, the choice by these authors lies among the following: (a) unilateral or bilateral adrenalectomy; (b) bilateral supradiaphragmatic splanchnicectomy; (c) left sided, unilateral splanchnicectomy; (d) bilateral decapsulation and denervation of the kidneys; and (e) nephro-omentopexy.

They believe that hypertension arises from a peripheral rather than a central cause, be it an abnormal sympathetic action or an endocrinal dysfunction, and if it is on a humoral basis it is most likely to be due to adrenal influence, or possibly the result of the action of vasoconstrictive substances which are products of a disordered metabolism. They, like many others, have found no tests to be used as criteria in judging a case to be suitable or not suitable for operation.

They have accomplished satisfactory relief of the subjective complaints of their patients; satisfactory lowering of the tension was accomplished in 8 of 12 cases; the retinal disturbances remained essentially unchanged; the function of the kidneys was not impaired by their operations; and the condition of the heart in general was improved by the operations.

The state of the kidneys is an important factor in the decision as to whether or not surgery will accomplish the desired end. If the hypertensive patient shows no kidney damage, splanchnicectomy or adrenalectomy is indicated. However, denervation, decapsulation, or nephro-omentopexy may be useful when the hypertension is malignant and the kidney function is obviously impaired. Cerebral accidents, rapidly progressive vascular and renal signs, and icterus are contraindications to surgery.

JOHN MARTIN, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Maisin, J. H., Estas, P., and Line, D.: The Radiological Treatment of Breast Cancer and Its Metastases. *Edinburgh M. J.*, 1939, 46: 529.

With a view toward ascertaining whether irradiation alone can offer as much as, or more than, surgery in the treatment of cancer of the breast, the authors submitted a considerable number of patients with this disease to such treatment. The results are reported in this article. Both operable and inoperable cases are included in the series. The cases of all patients having a movable tumor in the breast, ulcerated or not, with movable glands in the corresponding axilla, were classed as operable. A biopsy was done in each case.

As regards the methods of treatment at the beginning of their work, the authors tested various methods of external irradiation alone in operable cases, and they are still inclined to the belief that this will be the method of the future. However, they found that external irradiation was not suitable for the majority of their cases and subsequently used external irradiation combined with interstitial radium therapy. Roentgen rays at 200 and 400 kv., and radium applied by a 7-gm. bomb, were both used as sources of external irradiation. In some cases, 3 large fields were exposed: the supraclavicular region, the axilla, and the breast itself. In others, the entire chest, including all of these areas, was irradiated in one large field. The duration of the external irradiation was from one month to six weeks. Following this, radium needles were inserted. Detailed information is given relative to dosage and technique.

The same method of irradiation was used in the treatment of inoperable cancer in patients with good general health, in whom the lesion was limited to one-half of the chest.

When widespread metastases in the skin were present, only external irradiation was used. Single localized metastases to bone were treated simultaneously with the breast lesion. Widespread metastases were usually treated in one or two large fields. Metastases to the pleura yielded fairly good results, but involvement of the lungs or of the liver responded very poorly, if at all. Since cancer of the breast is very probably the sequence of disturbance in the function of the ovary, all patients who had not reached the menopause were sterilized. Medical treatment which aimed to produce remineralization, or to improve the oxidoreduction power of the organism, was included as part of the treatment and considered to be a valuable aid. Dietetic regulations tending toward growth inhibition also formed an important feature in the conduct of these cases.

The results obtained are tabulated. In comparing the percentages of patients with operable cancer who are living after five years, with the best surgical statistics, it is apparent that the results are at least as good as those following the radical operation. In the inoperable cases, although the ultimate results were poor, irradiation not only improved the local condition and that of most of the metastases, but lengthened the life of the individual.

ADOLPH HARTUNG, M.D.

HEART AND PERICARDIUM

Köster, K. H.: Pericardiectomy in Pericarditis Fibrosa; 2 Cases (Perikardektomie bei Perikarditis fibrosa; zwei Faelle). *Acta chirurg. Scand.*, 1939, 82: 595.

The chief emphasis in this report of 2 pericardiectomies is placed on the decrease of the venous pressure, as determined by the method of Moritz and Tabora, and the increase in the systolic output, as determined by the method of Liljestrand and Zander, an attempt being made to compare the Liljestrand-Zander method with that of Grollmann.

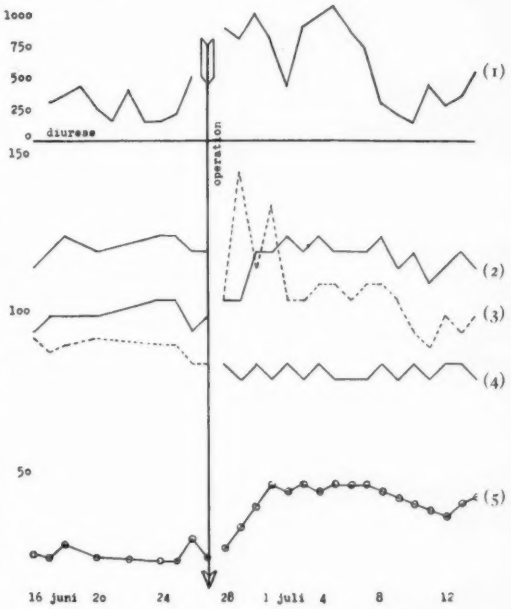

Fig. 1. Patient 1. Before and after operation. The reduced amplitude since that time has been around 35 with great deviations, and the pulse has been around 76. Curve (1) shows the urinary output, Curve (2) the systolic pressure, Curve (4) the diastolic pressure, Curve (3) the pulse, and Curve (5) the reduced amplitude.

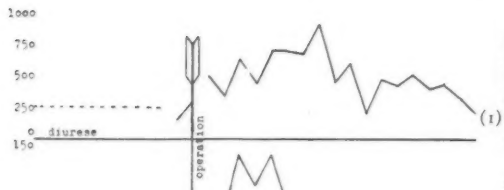

Fig. 2. Patient 2. Before and after operation. The reduced amplitude since that time was 40, and the pulse 70 (excluding period during which a partial block existed).

Both patients exhibited the entire gamut of classic symptoms: heightened venous pressure with prominent veins, cough, ascites, an enlarged liver with edema, a decreased systolic output with lowered blood pressure, pulsus parvus, cyanosis, oliguria, dyspnea on exertion, tachycardia, and exhaustion. Both had a marked pulsus paradoxus, but neither portrayed systolic retraction of the apex area.

The patients were operated upon under conduction anesthesia with novocaine and adrenalin given by injection from the second to seventh ribs, and by local infiltration of the operative-field. In both a flap was turned outward from the edge of the sternum, including the cartilaginous portions of the third to the sixth ribs, and in both the pectoralis muscle was dissected away from the flap before closure, and drainage was established.

In the first patient, in whom the cardiac symptoms had been of long duration, the line of cleavage was easily followed and an area of 6 by 7 cm. of heart muscle, beginning with the left ventricle, was laid bare. In the second, in whom the symptoms of cardiac involvement were acute, of recent occurrence, and of rapid course, the fibrosed pericardium was everywhere densely adherent, no line of cleavage could be found, and the dissection could not be carried clear down to the heart muscle. An area of 4 by 5 cm., however, was removed as thoroughly as possible.

The subsequent increase in cardiac output and decrease in venous pressure, together with improved diuresis are portrayed in graphs: the first patient, Figure 1, the second patient, Figure 2. The second patient, despite the relatively incomplete operation, has shown quicker and better improvement of his condition than the first one.

In these cases the Liljestrand-Zander method seemed to yield results similar to those obtained by other investigators with Grollmann's method.

JOHN W. BRENNAN, M.D.

ESOPHAGUS AND MEDIASTINUM

Hammar, J. A.: New and Old Facts Known about the Thymus Gland (Neues und Altes ueber die Thymusdruese). *Upsala Läkaref. Förh.*, 1939, 44: 319.

After reviewing in great detail all the facts known as to the anatomy, histology, embryology, histogenesis, morphology, and involution of the thymus, the author takes up the physiology of the gland and presents the following thesis on the function of the thymus:

The parenchyma of the thymus consists essentially of an epithelial reticulum permeated by lymphocytes which contain Vitamin B. This fact seems to constitute the basis for the experimentally proved property of the organ of favoring the growth of the body. In the thymus itself the presence of Vitamin B in the lymphocytes seems to explain the trophic effect of the cells upon the reticulum of the thymus. The number of the cells in the reticulum diminishes in proportion to the involutional rarefication of the lymphocytes in the thymus, and when the latter have almost completely disappeared, the remaining reticulum cells lose their reactivity and form the Hassall corpuscles, and the thymus becomes involuted.

Vitamin C is demonstrable in the reticulum cells of the thymus. Their relatively abundant presence might determine the function of the thymus in the process of immunization, in which focal cellular enlargements develop (Hassall corpuscles) in the reticulum, just as secondary follicles develop in the reticulum of the lymphoid tissue as a result of cellular enlargement. However, the Hassall corpuscles develop earlier than the secondary follicle and for the most part disappear almost entirely in the later stages of immunization. The significance of the inducting effectiveness of the thymus gland in immunization, an effect which allows the Hassall corpuscles to disappear at a time when the titer of the antibodies is still very low, is not as yet determinable, as nothing in the Hassall corpuscles indicates the processes responsible. The cellular degeneration regularly occurring in the larger Hassall corpuscles might lead to the assumption that the toxic substances are fixed there, just as is the case in the spleen with diphtheria and tetanus toxins. Similarly, in the results of the investigations in which thyroid was fed to chickens, of all the organs examined only

the thymus was found free of active effective thyroid-gland substances. It has also been found that the thymus, the lymphoid glands, and the spleen play the main part in the formation or deposition of antibodies.

At the time of puberty the gonads deliver sexual hormones to the blood, which produce a decrease in the number of lymphocytes in the thymus, the lymphoid organs, and the blood. The gradual diminution in the number of the thymus lymphocytes determines the involution of the organ. Inasmuch as the sexual hormones replace the Vitamin C in immunization (and detoxication), they compensate for the puberal and postpuberal lessened significance of the thymus gland.

A diminution in the number of lymphocytes of the thymus and the lymphoid organs also takes place in nutritional disturbances and similarly developing accidental involution, and these disturbances usually run a more acute course than in the involution of advancing years. The factor responsible for this is not at present determinable, but it is certainly not the sexual hormones. It is also unknown whether there is a compensation for the accidental retrogression of the thymus in this involution, but this is possibly not the case. However, it is well known that an organism weakened by hunger or similar influences has a diminished resistance to external injuries.

The author admits that the theory of the function of the thymus advanced by him does not constitute the final word on the subject, but he believes that it presents a distinct advance in our knowledge of the function of the thymus. Already some objections to it have been raised. One concerns the inability of Vitamin C to increase the signs of immunization in thymectomized animals, to which the author replies that even though in his experimental animals the significance of Vitamin C in the immunization is practically reduced or replaced by the appearance of the sexual hormones at the time of puberty, the resulting behavior is certainly not unexplainable. It could be explained by suitable experiments on prepuberal animals. The other objection is concerned with the fact that there seems to be no place for the significance of the innervation of the thymus. Our knowledge of this innervation is at present certainly very incomplete. It has been shown that this innervation is of a double nature: in the upper part of the neck a branch from the vagus nerve supplies the thymus lobe of the corresponding side; delicate nerve branches also reach the thymus from the sympathetic nerve plexus of certain adjacent blood vessels. It is impossible to determine the behavior of these different nerves in the interior of the thymus, especially during its involutions, as it has been shown that it is impossible to a marked degree to stain the nerves in the thymus with the usual nerve dyes. However, we do know that in man the thymus is supplied in about the fourth fetal month with an abundant ramification of vagus fibers in the medulla and relatively few sympathetic fibers in the cortex, and that both kinds of fibers meet in a nerve plexus at the border of the medulla and cortex. An illuminating factor may be the fact that when the exposed stem of the vagus is stimulated by an electric current, Vitamin B is released from the nerve stem itself. If it can be shown that a stimulation of the nerve has a similar influence upon the surroundings of the vagus branches, which at present is entirely unproved, the significance of the innervation of the thymus would no longer be entirely unexplainable. It is believed by the author that this innervation could well be incorporated as part of his theory.

LOUIS NEUWELT, M.D.

MISCELLANEOUS

Juzbašić, D. M.: Surgery of Rupture of the Diaphragm (Zur Chirurgie der Zwerchfellruptur). *Chirurg*, 1939, 11: 47.

The designation "traumatic hernia of the diaphragm" is not accepted by the Surgical University Clinic at Frankfurt a. M. because of the absence of a sac, which absence is important also from the insurance standpoint because of the confirmation which it gives of its accidental origin. The condition is more accurately described as a transdiaphragmatic prolapse of the abdominal viscera. Such an occurrence is readily understood in the case of great force applied to the chest, but it is found also following slighter traumas and even without trauma (B. Schultze: *Swinging for Resuscitation of the Newborn*). If there is no prolapse of the viscera, tear of the diaphragm cannot be diagnosed, and in the presence of prolapse, it can be diagnosed only with the aid of the roentgen rays. The mortality is 70 per cent with strangulation, 15 per cent without. Hence, early operation is advised. Various procedures are used: (1) transthoracic (irreducible prolapse), (2) abdominal (Mayo Clinic with over 100 cases), and (3) thoraco-abdominal, and (4) division of the phrenic nerve. The last named procedure is not recommended, first because it is not without danger, and, second, because, even though the viscera slip back into place, there is no assurance that the diaphragm will heal and that recurrence will not take place. Further, it cannot be known whether the intestine is injured by strangulation. Schmieden uses sometimes the thoracic, sometimes the abdominal operation. Disadvantages of the thoracic operation are the greater magnitude of the intervention and the fact that kinks may occur in the replaced intestine, and bring about intestinal occlusion. After the transthoracic operation, healing usually takes place by the round-about way of an empyema. Advantages are a better view of the operative field, easier separation of the adhesions, easier closure of the tear in the diaphragm. The disadvantages of the abdominal route lie in the absence of the advantages just noted for the transthoracic route. In order to get a better view of the diaphragm, Schmieden makes an incision in the middle of the upper abdomen, which curves horizontally over the umbilicus, and raises the costal

arch with a specially constructed hook. The author then discusses diaphragmatic hernia and hiatus hernia. Since these are usually small, most cases can be repaired successfully with the use of the abdominal route, but recurrences are frequent with this route (Key). The case histories of 4 patients are published, together with roentgen pictures.

Case 1. In a traffic accident the patient sustained a fracture of the seventh and eighth ribs. Operation was not performed till forty days later, when the diagnosis had been made by the aid of the roentgen rays. Under positive pressure anesthesia an incision was made between the eighth and ninth ribs. The stomach, the large intestine (which showed a constriction ring), and the omentum were within the thoracic cavity. The rent in the diaphragm was closed with interrupted sutures. Healing was preceded by empyema. At the end of two years there has been no recurrence.

Case 2. A four-and-one-half-year-old child had suffered from severe vomiting, independent of the ingestion of food, for some time. There was no history of trauma. The diagnosis was diaphragmatic hernia. Under basal anesthesia with avertin, combined with ether anesthesia, an incision was made in the seventh intercostal space. Loops of small intestine, the ascending colon with the cecum and appendix, and part of the transverse intestine were found in the left pleural cavity. A sagittal slit 4 cm. long was found in the diaphragm. There was no hernial sac. Reposition was difficult, although the adhesions were not dense. The diaphragm was closed. An air-tight closure of the thoracic cavity was effected with the exception of the space occupied by a drainage tube, the free end of which was introduced into a vessel containing water. For the first five days after operation symptoms of intestinal occlusion were present, but these disappeared spontaneously. In this case also suppurative pleuritis developed.

Case 3. A thirteen-month-old child had vomited soon after birth. The condition was first diagnosed as pylorospasm, and not until the child was examined roentgenologically was the correct diagnosis made. Under ether anesthesia an incision was made in the sixth right intercostal space. The condition was a true diaphragmatic hernia on the right side as the hernial sac was present. The greater part of the stomach was in the right pleural cavity. After subdiaphragmatic division of the phrenic nerve, the hernial ring in the central tendon, which was the size of the palm of the hand, was closed, partly by a purse string suture and partly by interrupted sutures. The wound was closed without drainage. Smooth healing ensued.

Case 4. The patient was a thirty-four-year-old man who ascribed his trouble to his having been dropped when he was an eighteen-month-old baby. At fifteen years he had vomited dark masses resembling coffee grounds and there had been blood in the stool. Thereafter he had been without symptoms for two years, after which he had been treated for a stomach affection in various hospitals. Not until he was thirty-four years old was the roentgen diagnosis of epiphrenic diverticulum made. The patient was in a debilitated condition. Operation was done under positive pressure ether anesthesia. The right rib was resected. In the diaphragm, which was very thin, was a wide defect extending toward the spinal column. Through this there protruded a portion of the stomach the size of a man's fist. The surface of the stomach was bound by adhesions to the edges of the defect in the diaphragm. There was no hernial sac. The only way of closing the opening in the diaphragm was by suture of the dome to the posterior wall of the thorax. The wound was closed without drainage. Nineteen days after the operation it was necessary to open the wound because of the presence of suppurative pleuritis. Drainage was instituted. On discharge the patient was completely free of symptoms, but the roentgen picture showed the tied-off portion of the stomach again outside of the abdominal cavity. Nevertheless, it was two years before the patient had a recurrence of symptoms. Operation was done under avertin basal anesthesia combined with ether anesthesia, but this time by the abdominal route, and the stomach was successfully brought down. It showed a distinct constriction ring. An esophageal hiatus, the size of a five-mark piece, was found. The uppermost part of the fundus was adherent to the diaphragm. Sutures were placed around the dilated hiatus, the fundus being made fast for the space of three-fourths of its circumference and a portion of the posterior surface left free. Healing was smooth. (Franz). Florence A. Carpenter.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Haglind, O.: Pneumococcus-Peritonitis in Children (Ueber die Pneumokokkenperitonitis bei Kindern). *Acta chirurg. Scand.*, 1939, 82: 549.

The so-called genuine or cryptogenic pneumococcus-peritonitis, under which term is understood a peritonitis in which the pneumococcus is encountered exclusively as the pathogenic bacterium in the peritoneal fluids, is made the subject of this study. The author collects 77 reports from the records of various hospitals of southern Sweden, and evaluates them in the light of the statements of various other authors on this subject. The material comprises that of the years from 1919 to 1934, inclusive, and is rather narrowly selective in that about 100 cases were regarded as uncertain as to diagnosis and were excluded except for inclusion in the total incidence and in other tables for more inclusive results.

The relationship of the incidence of pneumococcus-peritonitis to that of acute appendicitis, the condition which is the hardest and the most important to distinguish, is closely scrutinized, especially in girls below the age of ten years in whom pneumococcus-peritonitis is by far the most prevalent. In the whole material the incidence of pneumococcus-peritonitis as compared with acute appendicitis in girls from one to five years of age was as 1:2.5, and from five to ten years, 1:11, and, finally, from ten to sixteen years, 1:269. As compared with appendicitis peritonitis the corresponding figures are: from five to ten years, 1:3.5, and from ten to sixteen years, 1:36. Therefore pneumococcus peritonitis must always be considered in a young girl with the picture of an acute peritonitis. Of the 77 patients of the author, 71 were females, i. e., 92 per cent of the total number of cases. In giving the total incidence according to the year of life, the author does not give figures but refers the reader to a graph which shows the rather uniform rise to the acme at eight years and then a rapid fall which indicates the rather rare incidence after the tenth year.

No relationship to the incidence of infections in other places in the body, especially pneumococcic infections, except a suggestive increase in the number of cases of pneumococcus-peritonitis in Halsingborg (5 of the 13 cases during 1928) and Karlskrona (5 of the 12 cases during 1927, and 4 during 1928) during years when there was a noticeable increase in croupous pneumonia cases, could be deduced from the author's material. In 7 cases in which, under symptoms of pneumococcus-peritonitis, the abdomen was opened, the only findings at this early period were a reddened intestine and swollen glands (enteritis); the patients later all developed pneumococcus-peritonitis.

Of course the overwhelming predominance of pneumococcus-peritonitis in young girls tends to subordinate every other portal of entry to that of the female genitalia in importance. However, the author is unable from his own material to offer any help in deciding the disputed question of the female genitalia as a portal of entry in these cases.

In evaluating his material for characteristic symptoms the author finds that herpes is rare (only 1 case); symptoms from the respiratory organs were slightly more common (15 cases); and early symptoms suggesting involvement of the digestive tract are uncharacteristic. The symptoms which most nearly seem to characterize pneumococcus peritonitis are the frequent (in 62 per cent) and troublesome diarrhea, the rapid development of a high temperature, and the early and marked bad general condition of the patient. Of course, if abdominal puncture or laparotomy be resorted to the pneumococcus will be found either in pure culture or associated with other organisms. These organisms should be typed in every case, and the author is of the opinion that the necessity of surgery in the individual case in the future will depend upon the results of serum therapy to a great extent.

As regards the question of surgery the author's material disclosed that 67 per cent of the 56 patients operated upon in the acute stage, i.e., in the first three days, died, while 1 (14 per cent) of 7 patients operated upon during the abscessed stage died; all of the 4 patients who were not operated upon died. However, the number of cases in these groups is rather small, and it is admitted that the most fulminant cases have the highest mortality and these are just the patients who would enter the hospital first and be operated upon earliest. All in all the author believes that more experience is necessary before a definite conclusion as to the time for operation can be reached, although he seems to incline, along, allegedly, with an always increasing number of other physicians, toward the conservative side.

JOHN W. BRENNAN, M.D.

GASTRO-INTESTINAL TRACT

Jones, F. A.: Hematemesis and Melena: Salt and Water Requirements. *Brit. M. J.*, 1939, 2: 332.

An examination of the post-mortem records of fatal cases of hemorrhage from simple peptic ulceration, at St. Bartholomew's Hospital over the period from 1931 to 1935, revealed data suggesting that in 18 of 39 cases the hemorrhage had ceased at the time of death and many of the patients had not bled for some days previous. Therefore, it was surmised that other factors might have been present which led to the death of these patients. The evidence suggests that dehydration may have played an important part.

Examination of the post-mortem records revealed that many cases of hematemesis and melena have

ended fatally when the hemorrhage apparently had ceased. A careful analysis revealed that severe dehydration was the common factor in such patients and that symptoms were masked by the liberal administration of opiates. This dehydration was partly due to an insufficient fluid intake and partly to forced diuresis. The latter presumably resulted from a greatly increased excretion of urea possibly caused by the digestion of blood in the bowel.

It should be the rule that patients should receive enough fluid to meet the normal requirements of the kidney, skin, and lungs, and also to cover any abnormal fluid loss. It is recommended that they be given 10 gm. of sodium chloride daily during the first few days after the hemorrhage.

JOHN W. NUZUM, M.D.

Rieder, W.: Unsettled Questions on the Surgery of Gastric and Duodenal Ulcers. Surgical Healing of Gastric Ulcers in the Cardiac Region (Strittige Fragen in der Chirurgie des Ulcus ventriculi und Ulcus duodeni. Chirurgische Behandlung des Cardianahen Ulcus ventriculi). *63 Tag. d. deutsch. Ges. f. Chir.*, Berlin, 1939.

A discussion of the surgical treatment of ulcers in and about the cardiac end of the stomach requires a definition of those ulcers which should be considered truly cardiac, because it is well known that the ulcer pathology with its inflammatory infiltration of the gastric wall often extends further than is apparent from x-ray study. For this reason the same difficulties are present in the resection of an ulcer which is apparently subcardiac as in the resection of one that is truely cardiac.

This consideration includes ulcers in the upper third of the stomach, with a separate discussion of the atypical subcardiac ulcers seen in gastric volvulus, with or without relaxation of the diaphragm, or with a true diaphragmatic hernia. Clinical and pathological studies have demonstrated that from 6 to 8 per cent of all gastric lesions are in the cardiac region. The Leipzig material of 1,276 cases included 72, or 6 per cent, subcardiac lesions.

The clinical findings associated with lesions in the cardiac region are mild as a rule. There is a characteristic radiating pain into the scapular regions, to the sternum, to the heart, or to the left arm, which symptom has led to confusion with angina pectoris in the diagnosis. Twenty-five per cent of the subcardiac lesions in the Leipzig Clinic were associated with a marked hyperacidity, and in the remainder the acid values were normal or low.

Diagnosis is best established with the x-rays in the cases with ulcers which are high in the cardia, but even with the x-rays there are marked difficulties in differential diagnosis because lesions on the posterior wall are covered by the liver and spinal column as well as by irregular heavy folds of mucosa. Then again there may be deep diverticula which often cover and enclose the ulcer. The occurrence of subcardiac outpouchings, which appear temporarily and usually are functional, is also a fact well known. During the last four years the Leipzig Clinic had 3 patients with this condition, 2 of whom were operated upon because the roentgenologist believed they had ulcers located high in the cardia. Despite careful examination and exploration of the open stomach during the operation no ulcers could be found. This functional condition occurs frequently but disappears with anesthesia. Similar sac-like pouches have been described by Moulier and Debray as "recesses." For this reason, unless the ulcer is confirmed by surgical exploration, errors in diagnosis are readily possible, and permit the impression that healing has followed conservative measures. It must be an inviolate rule not to operate upon high cardiac ulcers without two or three attempts at cure by medical therapy. Good results have, however, been reported in the treatment of these ulcers by jejunal-sound feeding.

Two basic attacks may be utilized in surgical therapy: (1) radical intervention with removal of the ulcer, and (2) measures by which the healing of the ulcer follows changes in physiology. Exclusion or purse-string suture of the ulcer is not done at the Leipzig Clinic because of the understanding that the ulcerative disease is not a local disease but an organic one. The purely local measures have been followed by a large number of unsatisfactory results. In addition, the sleeve resection of Riedel and Payr has been abandoned because it also was followed by recurrences.

In an early series of 6 high cardiac ulcers in the Leipzig material, which were now restudied from twelve to sixteen years after the operation, 1 patient remained perfectly well for twelve years; 1 had persistent pain; 2 have definite ulcer recurrence, and 2, ten years after operation, were cachectic principally because of stomach pathology.

On account of the better understanding of the underlying physiology, cardiac ulcers are now treated by subtotal gastric resection, the circular form of the gastric outlet being maintained as well as possible. A "step-type" of resection done without clamps has been developed. When the author does this "step" resection he partially closes the open end of the stomach at the lesser curvature, and endeavors to be sure to prevent leakage from the dangerous lesser-curvature edge. Whenever possible he attempts to use healthy gastric tissues on the greater curvature so that he has now developed a surgical technique which he calls the "step forming" or tube resection (Schmieden, Neugebauer, Kirschner). Two step-forming clamps are used in this resection.

Review of the world's literature shows that a subtotal "step" resection of the stomach and a resection making the stomach "tube-like" in form are the two most commonly used procedures for these ulcers located high in the cardia. From 1915 to 1939, 30 of these ulcers were resected with an operative mortality of 16.5 per cent; the total mortality for gastric surgery from 1926 to 1935 was 3.4 per cent. More than 90 per cent of the patients who survived were restored economically. It is of major im-

portance that the patients be in good pre-operative condition and not too old.

For that group of patients in whom radical attack is inadvisable, jejunostomy is recommended. It affords an immediate response which is fair, but sooner or later relapse occurs. Jejunostomy or gastrostomy may, however, be replaced by jejunal-sound therapy. Gastro-enterostomy is usually followed by bad results because the gastro-enterostomy itself does not have the ability to change the gastric function sufficiently for the healing of these lesions.

Knowing that the pyloric antrum plays an important rôle in stimulating the fundal secretion, Kelling for the first time in 1915 performed palliative resection of the pyloric region. This trend was followed by Madlener, who showed that, regardless whether a palliative resection is done, with restoration of the gastro-intestinal continuity, by means of either a Billroth I or Billroth II type of stoma, it is essential to remove at least one-half of the stomach. The time-proved viewpoint that at least two-thirds of the stomach must be removed is still correct. Madlener has reported excellent late results and a low mortality in a large series of palliative resections. The literature contains reports of 120 cases operated upon by the Madlener technique. The operative mortality was 1.7 per cent and most of the patients have remained symptom-free.

A review of the tube type of resection and palliative resection shows equally satisfactory end-results from both methods. The greatest objections to palliative resection are the dangers of hemorrhage, perforation, cancerous changes, and cicatrization. In 120 cases treated by palliative resection there were 4 malignant degenerations, in which, however, there may have been an error in the original roentgenological diagnosis. The most satisfactory end-results have followed high resection, but this should be done only by qualified experienced surgeons in properly selected patients, who, of course, have not been helped by conservative measures. Should the technical difficulties be such that the mortality of radical intervention is too high, the palliative resection of Kelling-Madlener may be utilized as a life-saving measure except in those patients in which there is a suspicion of malignancy. In this type of patient the author utilizes radical surgery despite all hazards. If the patient's condition is such that even palliative resection is too formidable and if jejunal-sound therapy cannot be used, jejunostomy remains. Gastro-enterostomy for these cardiac ulcers is unsatisfactory and is to be done only in the presence of pyloric stenosis in patients who are poor risks.

(W. Rieder). Samuel J. Fogelson, M.D.

Fromme, A.: Palliative Resection (Gastroenterostomie oder Palliativresektion (bessere Nomenklatur: Resektion zur Ausschaltung: R.z.A.) beim nichtresezierbaren Ulcus duodeni?). *63 Tag. d. deutsch. Ges. f. Chir.*, Berlin, 1939.

In every large surgical clinic there are many patients with gastric and duodenal ulcer and the surgeon must decide whether the ulcer lesion itself can or should be resected. Operability rests upon the degree of involvement of the adjacent organs. Of major importance is extension of the ulcerative process to include the pancreatic ducts, which have many variations as shown by Claremont. The proximity of the ulcerative process to the common duct and to the blood vessels must also be considered. After resection the problem of adequate duodenal closure requires major consideration because experience has shown that inadequate closure is a most frequent source of peritoneal complications secondary to gastric resection. The technique for avoiding these complications with methods developed in the past few years by Nissen was presented by the author.

After consideration of the dangers associated with a radical operation, the surgeon may choose a less hazardous routine, as, for example, resection to exclusion or gastro-enterostomy. The advantages and disadvantages of the above methods were presented. With each of these the ulcer remains *in situ*, and the dangers of hemorrhage, perforation, or carcinomatous development still remain. Cancerous changes in a duodenal ulcer occur rarely but this possibility cannot be completely disregarded inasmuch as Fromme has had 2 such complications in his material.

The most feared late complication is gastrojejunal ulcer, which may occur after either resection to exclusion or gastro-enterostomy. It is much less frequent after the former than after the latter. The difference in incidence of postoperative gastrojejunal ulcer may be caused by the fact that resection to exclusion removes much of the antrum, and the antrum is a major factor in ulcer development because of its stimulating effect upon the fundus to secrete hydrochloric acid. The site of transection in resection to exclusion may be in the duodenum, pylorus, or antrum. When it is in the duodenum there is no greater likelihood of gastrojejunal ulcer than after the most radical surgery because practical experience has shown that within a very short while the ulcer, which is left behind, will heal. Similar healing follows transection through the pylorus, but if the separation is made in the antrum, hyperacidity may still occur with gastrojejunal ulcer formation.

In the more popular technique, the line of section is from 3 to 4 cm. orally from the pylorus in the antrum. With this technique there results a small antral pouch formation. This may be filled by food or bile and pancreatic juice which may back up, and all these factors together cause acid stimulation in the fundus segment. Thus, there occur factors similar to those present following a von Eiselsberg unilateral exclusion type of operation which had to be abandoned because of the frequency with which it was followed by peptic jejunal ulcers.

The Finsterer method of resection to exclusion is based upon the von Eiselsberg operation. Finsterer, however, has utilized an extensive gastric resection

to decrease the development of peptic jejunal ulcers. It seemed more logical to Fromme not to reduce the size of the fundus, even though it is the source of the acid, but to reduce the size of the antral segment from which the stimulus for acid secretion arises. This was done by extirpation of the mucous membrane. The author therefore recommends the technique described by Wilmans, Druener, Buerkle de la Camp, Plenk, *et al.*, namely, extirpation of the mucous membranes as far as possible up to the pyloric ring.

At the same time the author expresses himself as being opposed to unduly large resection of the stomach in resection to exclusion, as well as to too large a resection in the radical operation. Because of fear of the rarely occurring later complications of jejunopeptic ulcer following resection, so much stomach is taken away that not only is a digestive organ sacrificed, but also an organ with many other functions. The factor for the development of a postoperative ulcer in the jejunum rests in disturbed motility, which is very unlikely following the type of Billroth I operation recommended by Hofmeister. In this procedure a short loop of bowel is utilized for a posterior gastro-enterostomy without the addition of an entero-anastomosis.

In the last sixteen years the author has operated upon 382 patients with duodenal ulcer, of which 50 per cent, or 190, had radical surgical intervention with a mortality of 3.7 per cent; 88 or 23 per cent had resection to exclusion with a mortality of 6.8 per cent; and 104 or 27 per cent had a gastro-enterostomy with a mortality of 5.8 per cent. In later years gastro-enterostomy was practically replaced by resection to exclusion, and only 1 case treated by this method has developed a peptic jejunal ulcer, whereas in a similar period of observation 22 per cent of the patients undergoing gastro-enterostomy were proved surgically to have peptic or jejunal ulcers.

The author therefore concludes that a definite percentage of duodenal ulcers do not lend themselves well to an extensive resection which is too hazardous. When a duodenal ulcer cannot be resected, or can only be resected with extreme hazard, a resection to exclusion should be done. It is essential that in this operation no antral mucous membrane and no antral cavity for acid stimulation be left. For this reason, when the site of transection is in the antrum the mucous membrane and the small remaining antral rest must be extirpated. Gastro-enterostomy should be considered only for those cases of duodenal ulcer in which resection to exclusion is not possible or in which more extensive surgery is too hazardous. It may be used only in old patients in whom hyperacidity cannot occur.

(A. Fromme). Samuel J. Fogelson, M.D.

Cave, H. W.: Chronic Intractable Ulcerative Colitis: A Surgical Problem. *J. Am. M. Ass.*, 1939, 113: 549.

Many forms of treatment have been recommended for chronic ulcerative colitis, and not infrequently certain of these measures are followed by temporary improvements. More frequently the cycle of the disease continues and progressing pathological changes thwart the efforts of the physician and destroy the health of the patient. It is impossible to say that after any interval of respite the disease will not recur.

The writer has reviewed a series of 257 cases; 158 of the patients were treated at the Roosevelt Hospital, with a gross mortality of 7 per cent. Six patients in this group died while under medical supervision, a mortality of 3.7 per cent. Twenty-seven patients were operated on and 5 of these died, giving an operative mortality of 18.5 per cent.

Although 27 patients operated on for this disease represents a small number, the author believes that it is of sufficient size for the formulation of certain conclusions. If the condition of such desperately ill patients cannot be controlled completely by medical management, surgical intervention may be necessary. Surgical intervention is indicated for perforations, repeated hemorrhages and strictures, for diffuse polyposis with or without malignant involvement, and for conditions not relieved by medical management. Operative procedures must be based on and determined by the extent and situation of permanent damage to the colon. Both pre-operative and postoperative medical supervision is essential to a successful outcome, for many patients are dehydrated, anemic, and septic.

If the colon and rectum are involved only on the left side, transverse colostomy, with removal of the colon and rectum on the left, is justified. Should the colon be diseased on the right side, and the rectum and sigmoid colon are not involved, ileosigmoidostomy followed by subtotal colectomy is sufficient. With extensive disease of the entire colon, removal of the affected bowel is accomplished in three or four stages.

Of the 27 patients operated on 5 died, giving an average mortality of 18.5 per cent. An average gain in weight of 42 lb. and marked clinical improvement seem to justify surgical intervention in selected cases. John W. Nuzum, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Smith, H. P., Ziffren, S. E., Owen, C. A., and Hoffman, G. R.: Clinical and Experimental Studies on Vitamin K. *J. Am. M. Ass.*, 1939, 113: 380.

It is the purpose of the authors to discuss the bleeding tendency often present in patients having biliary fistulas or obstructive jaundice. In many of these patients death results from persistent hemorrhage which is frequently initiated by operation or follows operation. It is now definitely known that the bleeding results from an abnormal lowering of the plasma prothrombin level, and that in most cases this bleeding can be relieved with Vitamin-K. The authors outlined a simple method devised for the recognition of deficiency of Vitamin K.

Vitamin-K deficiency is to be suspected in all patients presenting biliary fistulas or obstructive jaundice. The degree of deficiency is greater in cases of long duration, but it is sometimes marked when the obstruction is of recent origin, i.e., of two or three weeks' duration. In the presence of a Vitamin-K deficiency it is important that patients receive Vitamin-K therapy for several days before any operative procedures are undertaken. The ordinary tests for the bleeding and clotting time reveal the abnormality only when the prothrombin deficiency is extreme. They give normal values when the plasma prothrombin level is merely approaching the danger zone. Therefore, these tests fail when they are most badly needed. The two-stage technique for the titration of prothrombin gives the most exact measure of Vitamin-K deficiency yet devised. However, the method is too complex for routine clinical use. The authors have recently devised a test carried out on the whole blood at the bedside which is relatively simple and efficient.

With a serological pipette, 0.1 c.cm. of thromboplastin is placed in a small serological tube. In the tube is then placed blood, freshly drawn from the patient, up to the 1 c.cm. mark on the side of the tube. The tube is at once inverted over the finger to obtain complete mixing of the blood and the thromboplastin. Next the tube is tilted every second or two in order to observe clotting. As a control, the test is also carried out on the blood of a normal subject. The calculation is as follows: if the patient's blood clots in forty-eight seconds and the normal person's blood in twenty-four seconds, the clotting action is calculated to be 50 per cent normal. The experience with a large group of patients having biliary fistulas or obstructive jaundice shows that bleeding commonly occurs when the test gives values of 40 per cent or less. In extreme cases the level falls as low as 15 per cent of normal while values of from 40 per cent to 70 per cent are definitely in the danger zone.

Therapeutic use of Vitamin K. Vitamin K is readily obtained in crude form by the extraction of alfalfa meal. It can be purified by a variety of chemical procedures. One of these preparations, in capsule form and dissolved in oil, is already on the market. Much is still to be learned about the amount of Vitamin K to be administered. Some Vitamin K is formed by intestinal bacteria and some is present normally in the diet, hence, the daily feeding of bile prevents the fall of prothrombin incident to biliary fistula. Feeding bile also restores the prothrombin level to normal in cases in which it has already fallen to lower levels. To obtain a rapid rise in the prothrombin level the writers administer daily the Vitamin-K extract from 300 to 400 gm. of alfalfa meal. Evidence now at hand indicates that this dosage is much larger than that employed by some other workers.

In treating patients bile or bile salt must be fed along with the vitamin to aid in the absorption of the latter from the intestine. It is customary to feed daily at least 1 oz. of bile, or its equivalent in the form of dried bile or bile salt. The rate at which the plasma prothrombin level rises with Vitamin-K therapy varies in different patients. A definite rise occurs in the majority in twenty-four hours, but from three to eight days of treatment are usually required to obtain the maximum response. Also it should be emphasized that vitamin treatment should be continued during the postoperative period, especially if bile continues to drain from the wound.

Finally it should be mentioned that Vitamin K is of no value in the treatment of hemophilia or thrombocytopenic purpura. In these diseases there is no deficiency in Vitamin K and no deficiency in prothrombin. In cirrhosis of the liver or severe cases of hepatitis the "factory" that forms prothrombin is disordered and the disease is not essentially one of Vitamin-K deficiency.

JOHN W. NUZUM, M.D.

Biebl, M.: Incomplete Reversed Eck Fistula in Human Beings (Inkomplette umgekehrte Ecksche Fistel beim Menschen). *63 Tag. d. deutsch. Ges. f. Chir.*, Berlin, 1939.

There are two types of experimental Eck fistula. The first is the true Eck fistula (lateral anastomosis between the portal vein and the vena cava with ligature of the portal vein above the anastomosis). Such a fistula has been made a few times in human patients, all of them with liver cirrhosis and ascites, and all of them died after days, weeks, or months. The other type is the reversed Eck fistula (lateral anastomosis between the portal vein and the vena cava with ligature of the vena cava above the anastomosis). The principle of this operation has not heretofore been employed on human patients. Biebl carried out many such operations upon dogs, however, during the period from 1927 to 1930, not only in the Marburg and Koenigsberg clinics, but also at the Mayo Clinic with Mann, a well known American investigator of the subject.

In the course of these observations Biebl was impressed by the fact that in animals the true Eck fistula was always accompanied by severe manifestations, emaciation and tissue intoxication. The reversed Eck fistula, on the other hand, was followed by a good general condition of the animals, a maximal gain in weight, a great appetite, and assimilation of a variety of diets. Under the impression of these observations it occurred to Biebl that the reversed Eck fistula might be of benefit to human beings. In theory he believes that it might be of value in the following conditions: (1) very severe cases of hepatogenic jaundice, (2) very severe cases of hemolytic jaundice, and (3) very severe cases of pernicious anemia.

In the course of several years Biebl could apply the operation to cases only of the first group:

In July, 1935, he operated in Koenigsberg upon a twenty-eight-year-old patient who had been deeply jaundiced for three months and was in a desperate

condition from every standpoint. At operation he found nothing except the classical picture of hepatogenic jaundice; he determined to perform the reversed Eck fistula. It appeared that in man anatomical considerations were such that a complete ligature of the vena cava should not be done, and accordingly after doing a lateral anastomosis between the vena cava and the portal vein, he partially ligated the vena cava above the anastomosis, diminishing it to the caliber of a lead pencil (so-called incomplete reversed Eck fistula). The patient died four weeks later of a progressive thrombosis of the vena cava and portal vein. This thrombosis was evidently due to the then imperfectly performed technique of vessel suture, the too narrow anastomosis, and the too great narrowing of the vessel caliber.

In Magdeburg, Biebl encountered a quite similar case of hepatogenic icterus in April, 1938. This time he again performed the reversed Eck fistula, making the stoma between the vessels as large as possible and constricting the vena cava above the anastomosis to the size of the index finger. The operation proceeded very smoothly from a technical standpoint. The sixty-four-year-old man lost his jaundice quickly and was cured, and, today, one year after operation, enjoys the best of health. He has gained 50 lb., regaining his former weight. During the daytime he develops edema of the ankle which disappears after a night's rest in bed. There is no ascites.

Biebl does his vessel suture with the open technique and draws the vena cava and portal vein up into the wound with the aid of tape. The critical part of the operation, during which the great vessels are completely shut off for a time, is tided over with a transfusion and the administration of intravenous fluids. The rationale behind this reversed Eck-fistula operation is to supply the injured and malfunctioning liver cells with the greatest amount of blood possible. It may be that the toxic substances absorbed from the intestine and perhaps responsible for the liver injury are beneficially diluted by the vena-caval blood and rendered less noxious. Biebl believes that all human patients with jaundice due to primary liver disease should be given the benefit of this operation. He does not believe that the true Eck fistula is of value in such cases.

(Max Biebl). August Jonas, Jr., M.D.

Goumain and Poinot: A Rare Form of Acute Cholecystitis: Hemocholecystitis (Une forme rare de cholécystite aiguë: l'hémocholécyste). *Bordeaux chir.*, 1939, 10: 169.

Hemocholecystitis was first described by Naunyn in 1892 and may be defined as intravesicular hemorrhage. Cornioley in 1927, and Fiessinger *et al.* in 1937, presented collective reviews of this subject. The authors observed a case in a woman seventy-two years of age who was admitted to the hospital for symptoms of acute peritonitis which had been present for twenty-four hours. She had been seized suddenly with violent pain in the epigastrium and vomiting which was at first alimentary and later bilious. She had been on a diet for dyspeptic disturbances and suffered annual attacks lasting from four to five days with vomiting but no particularly characteristic symptoms. There had been no jaundice and no discoloration of the stools. However, during an attack eight years previous to admission, which had lasted for eight days, the stools had been discolored although there was no jaundice. Upon palpation of the abdomen it was observed that the right hypochondrium was less mobile than the left and there was muscular resistance in the right subumbilical region associated with purely local pain. This picture of right peritonitis with the dyspeptic history suggested perforated ulcer or a possible cholecystitis. Operation revealed a very dark gall bladder which yielded blood on puncture. A retrograde cholecystectomy was done. The patient was discharged in good condition after three weeks following a smooth recovery. She died about a month later of bronchopneumonia.

Hemocholecystitis is very rare, and only about 40 cases have been reported in the literature. It cannot be diagnosed clinically as a rule. Chiray has emphasized the severe state of shock with a rapid fall in the pulse rate followed by a very painful tumor in the right hypochondrium which becomes progressively larger. Chiray likewise emphasizes the hard consistency of the gall bladder, but this is very difficult to demonstrate because of the defensive rigidity of the abdominal wall. The diagnosis usually established is that of acute cholecystitis or gangrene of the gall bladder and it can be corrected only at operation.

As regards the pathogenesis, two types of hemocholecystitis have been differentiated according to whether or not calculi could be regarded as a causative factor.

In the calculous type of hemocholecystitis, the hemorrhage is the result of an erosion of the mucosa of the gall bladder in the absence of an inflammatory process or hemorrhagic syndrome. Small mechanical hemorrhages are found. The history of the patient usually reveals symptoms of calculus. The gall bladder is large, distended, and of a purple color. The hemorrhage appears to develop more by transudation than by actual erosion. In addition to the mechanical hemorrhage, there may be hemorrhage of infectious or toxic origin. In the latter might be included infarcts of the gall bladder. Still another pathogenetic factor is perivascular sclerosis. These factors may operate alone or in combination. The course of the condition varies; as a rule the hemorrhage remains intravesicular and only rarely appears as melena. Intraperitoneal rupture with hemoperitoneum has also been reported as rupture into the intestine. The treatment consists of cholecystectomy much facilitated by the absence of adhesions and inflammation. In infected hemocholecystitis in debilitated patients it might be preferable to begin with a cholecystostomy with drainage of the in-

fected bile. This is advisable particularly in the presence of calculus of the choledochus.

EDITH SCHANCHE MOORE.

Walters, W.: Surgical Treatment of Diseases of the Bile Ducts. *Surg. Clin. North Am.*, 1939, 19: 845.

The author cites cholangitis as being defined as "an inflammatory process occurring in and around the walls of the intrahepatic biliary passages, the pathologic changes of which vary from simple catarrhal involvement of the lining epithelium to periductal fibrosis and thickening of the duct walls, lymphocytic infiltration and even abscesses in and about the biliary passages."

Catarrhal choledochitis is the inflammation of the common bile duct which accompanies catarrhal cholecystitis.

One type of choledochitis with associated cholangitis is usually found in association with subacute pancreatitis, and is described as "noncalcareous, inflammatory biliary obstruction associated with cholecystitis."

Suppurative cholangitis is a very serious condition, most commonly occurring in persons past middle age.

The diagnosis may be difficult; sometimes it cannot be made before operation, or necropsy reveals the true pathological condition. Suppurative cholangitis should be suspected if severe constitutional symptoms develop in a person who has a history of cholelithiasis or choledocholithiasis or a biliary obstruction caused by a neoplasm. In the cases for which the patients have had no previous surgical treatment, malarial and amebic abscess of the liver must be ruled out.

The author believes that treatment is best directed toward prevention by means of early attention to disease of the biliary tract, removal of a diseased or stone-filled gall bladder, and relief of obstructive lesions of the biliary tract as soon as the diagnosis can be made and before this serious condition has developed. T-tube drainage of the common bile duct may be advisable. In an occasional case of tumor of the head of the pancreas producing biliary obstruction, cholecystogastrostomy or choledochoduodenostomy may be done. If the suppuration is extensive and multiple abscesses have developed, surgical intervention may seem useless, but recovery may occur with drainage of the common duct and the large abscesses. Medical treatment has not been of much value in the past, but it is to be hoped that sulfanilamide will be of aid in the future.

Choledocholithiasis is the most common pathological condition found affecting the bile ducts.

The symptoms resulting from the presence of stone in the common duct vary with the degree and type of obstruction produced.

Extrusion of a stone into the duodenum is signified by abrupt cessation of the colic and gradual and complete clearance of the jaundice within a few days' time. Unless another stone descends from the gall bladder, there will be no further jaundice, although symptoms referable to the gall bladder may continue.

The most characteristic type of obstruction caused by stone of the common duct is produced by the ball-valve action described by Fenger, in which the stone intermittently blocks the lower end of the common bile duct until sufficient accumulation of bile above the blockage point and consequent dilatation of the duct release it.

The author holds that a consideration of choledocholithiasis must include both cases in which the gall bladder has been removed and those in which the gall bladder is still present. A definite clinical diagnosis of stone in the common duct may be difficult to make in cases in which the gall bladder is present, since all the symptoms of choledocholithiasis, including jaundice, can be produced either by calculous or non-calculous cholecystic disease. However, since surgical intervention is always advisable in these cases, the common duct can always be examined at the time of cholecystectomy and the presence or absence of stone in the duct can be determined.

Enlargement of the common bile duct is an almost infallible indication that obstruction is or has recently been present.

Exploration should include: (1) the passage of graduated scoops through the lower end of the duct and into the duodenum to prevent the overlooking of small stones impacted in the ampulla of Vater, (2) dilatation of the sphincter of Oddi both to prevent postoperative spasm and to allow small, overlooked intrahepatic stones to pass through the ampulla into the duodenum.

If cholecystectomy has been previously performed, the problem of pre-operative diagnosis of stones in the common duct is still not an easy matter. The condition of the gall bladder at the time it was removed, and whether or not it contained stones, are of importance, since non-calculous cholecystic disease is only occasionally accompanied or followed by stones in the common duct.

In the author's experience, choledocholithotomy can be performed with little more risk than primary cholecystectomy.

Careful examination of the common bile duct should be an integral part of every operation on the biliary tract. If the duct is enlarged beyond its normal size (comparable to that of a goose quill), if a stone is palpable, or if there is anything in the patient's history, such as jaundice, chills, or fever, that suggests the possibility of stone in the common duct, exploration of the duct should be performed as a routine procedure. Exploration of the common bile duct should also be advised for any patient who has had recurrent and intractable symptoms following a biliary operation of any kind. Other indications for choledochotomy are cases of chronic or subacute pancreatitis, or chronic or acute cholangitis.

Stones in the common and hepatic bile ducts, whether they are free or impacted, single or multiple, situated in the supraduodenal, pancreatic, or intra-

mural portions, are best removed by supraduodenal choledochotomy. The author's experience is that it should be possible to remove stones in almost any conceivable situation in the ducts through a supraduodenal incision.

It has been the author's practice to open the gall bladder and remove its stones first, so that they will not enter the common duct during exploration. The disposition of the gall bladder after the removal of its stones should be left until the common and hepatic ducts have been effectively treated. Palpation of the common bile duct is then carried out by introducing the index and second fingers of the left hand into the foramen of Winslow and, with the thumb above the hepatoduodenal ligament, gently compressing the duct between the thumb and fingers. By working upward to the longitudinal fissure and downward to the end of the common bile duct, the duct may be allowed to slip through the fingers. It is surprising with what accuracy small fragments of stone may be detected. The elusive single, floating stone may be "milked" upward from the pancreatic portion and fixed in a favorable position for removal.

It is frequently difficult or impossible to feel a single small stone in the lower end of the common bile duct or in the ampulla of Vater before the duct is opened. If the duct is enlarged or if there is a clinical history of recurring chills and fever, and jaundice, the author opens the duct, even though a stone cannot be felt. With a probe or a scoop in the common bile duct as a guide, a small stone may often be palpated that otherwise could not be felt. An exceedingly difficult and serious operation can often be made simple and safe if the stone in the common bile duct is located by palpation and if the surgeon works from the outer right side of the abdomen toward the duct at a depth of approximately that of the common bile duct. By grasping the duct and fixing the stone between the fingers of the left hand, the surgeon can open the duct and remove the stone by cutting directly down upon it. The stone or stones immediately present in the opening are removed and the bile and loose débris are gently sponged out. Scoops of various sizes are then introduced into the common and hepatic bile ducts and all remaining free stones are carefully removed with as little manipulation as possible. Not infrequently a scoop or probe will pass by a stone, giving the surgeon the impression that a stone is not present. For this reason, it is important to make the incision in the duct large enough to admit the finger, provided that the duct itself is sufficiently dilated. By using the forefinger as a probe the surgeon can be almost certain that the interior of the duct is clear. Removal of a stone or stones from the ampulla of Vater is most easily accomplished by first passing a scoop into the ampulla, then guiding the scoop with the fingers outside of the duodenum and gradually manipulating the stone until it is crowded into the hollow of the instrument. By maintaining pressure on the anterior surface of the duct with the fingers of the right hand and pressing the scoop and its contained stone against them with the left hand, it is possible to hold the stone in this position as the scoop is gradually withdrawn. The surest way to palpate a small stone in the ampulla, especially when the surrounding pancreatic tissue is swollen, is to pass as large a probe as will comfortably fit into the duct down to the ampulla and then palpate the ampulla from without, this instrument being left in place as a guide.

Stones in the hepatic duct or those which extend up into the right or left hepatic branches may often be overlooked, with the result that they descend into the ampulla and require secondary operations. These can usually be brought to the surface by careful manipulation with scoops, followed by irrigation of the anterior of the ducts, with a syringe attached to a small catheter. Many times it has been possible to flush stones out of the hepatic ducts when they probably could not have been removed in any other way. Although the continuity between the liver and intestine through the extrahepatic biliary tract should be definitely established, it is often difficult to be sure that all stones have been removed, for even if the greatest care is exercised, small calculi occasionally may be overlooked.

External biliary drainage consists of passing a catheter of suitable size through the opening in the common bile duct, and up into the hepatic duct. The catheter is stitched in place and the opening in the duct is accurately closed around it. Following this, most of the bile drains to the outside through the tube, which usually is allowed to remain in place for nine or ten days. At the end of that time, bile begins to discharge around it, and shortly afterward, the tube comes out of its own accord.

For drainage purposes, a suitably sized T-tube smaller in diameter than the common bile duct is placed in the common duct so that one arm of the cross-piece projects up in the direction of the hepatic duct and the other extends downward toward the duodenum. The two limbs of the cross-piece are trimmed, so that they are about 1 cm. in length. The long arm projects out through the wound. The common bile duct is carefully closed around the juncture of the two tubes, so that leakage will not occur.

The author believes that the advantages of T-tube drainage over other types of drainage are numerous. In most of the cases in which choledochotomy is indicated, there is considerable dilatation of the duct and cholangitis or pancreatitis. These are conditions which are not relieved readily. They are most satisfactorily treated by prolonged drainage of the common bile duct.

Strictures of the bile ducts are commonly classified as to their causes into four main groups: namely, (1) congenital strictures, (2) traumatic strictures, (3) inflammatory strictures, and (4) strictures caused by tumors.

Congenital obliteration of the bile ducts is a rare condition characterized anatomically by closure or atresia of the ducts. Diagnosis usually can be made

by a process of elimination with great certainty by the end of the second month of life. When it has been made, exploratory operation should be recommended.

The incidence of traumatic stricture is low, but the author believes that the condition is such a tragic accident that it presents an eloquent argument against the performance of operations on the biliary tract by any but well trained surgeons.

Injury to the common bile duct is usually referable to anomalies of the ducts or adjacent blood vessels which were not recognized at the time of operation, distortion of the parts produced by disease, clumsy attempts on the part of the surgeon to control bleeding in the vicinity of the ducts, or failure to expose adequately the common duct both above and below the cystic duct before the cystic duct is clamped and sectioned. If the common duct is injured under such conditions, it should be repaired immediately.

At secondary operation, it is often impossible to determine just how the injury occurred. In such cases, the ordinary landmarks are obliterated and it is often difficult to identify the distal portion of the duct or even to determine the exact site of the stricture. A common site of stricture is the junction of the cystic and common ducts and the next most common is the supraduodenal portion of the common duct. Strictures at the papilla or strictures of the hepatic ducts are much less common.

Benign stricture of the ducts is an extremely serious condition, since it produces continuous or intermittent biliary obstruction with the added element of extensive and progressive chronic cholangitis and pericholangitis.

Prolonged drainage of bile from the incision after cholecystectomy usually means that an injury to the common duct has occurred or a stone of the common duct has been overlooked.

In addition to care during separation of the gall bladder and the cystic duct from the common duct, the author calls attention to certain important general principles in the prevention of stricture: early recognition and early surgical treatment of diseases of the gall bladder and bile ducts, thorough and accurate technique in the surgical procedure, and complete primary operations whenever possible.

The most significant desiderata in the treatment of these patients are immediate drainage of the bile and a permanent passage to the intestine before cure is complete. In the presence of a total biliary fistula of short duration, it is frequently advisable to delay the reconstructive biliary intestinal anastomosis until most of the signs of infection in the liver and ducts have subsided. Cholecystenterostomy is rarely practicable because the gall bladder has usually been removed; also, if it is present, it may be diseased and thus not suitable for anastomosis, and the cystic duct may often be obstructed by obliterative inflammation. Plastic enlargement of the strictured common duct is usually impossible and rarely satisfactory; but transplantation of an established external biliary fistula into the duodenum for patients having complete stricture of the common and hepatic ducts is sometimes attended by brilliant results. From the experimental standpoint, resection of the stricture with immediate end-to-end anastomosis is the ideal method and when it can be satisfactorily done, it is usually successful.

Although resection of the stricture with end-to-end anastomosis is experimentally and theoretically the ideal method of reconstruction, the author believes that practically it has distinct limitations because of the difficulty encountered in the securing of the lower end of the duct and the tendency of the anastomosis to contract and produce subsequent obstruction. If the stricture proves to be an annular contraction, with a satisfactory length of duct above and below it, however, removal of the strictured portion of the duct and end-to-end anastomosis of the ends of the duct may be attempted. This procedure requires free mobilization of the duodenum, apposition of the ends of the duct without tension, and extreme nicety of suture. The anastomosis is made over either a T-tube or a catheter. If a catheter is used, one end must project beyond the sphincter of Oddi into the duodenum so that it will be pulled out by duodenal peristalsis.

After the stricture has been located, it may be simply split longitudinally, and a T-tube or catheter may be inserted in the hope that a permanent tract may develop after long contact with the tube. The author thinks this hope is rarely realized, although the immediate result may be good. When intestinal peristalsis pulls the tube out, contraction frequently occurs, and jaundice once more appears.

According to the author, results have demonstrated that the method of hepaticoduodenostomy, first successfully performed by W. J. Mayo in 1905, is the most practical, most widely applicable, and most successful procedure for re-establishing the natural course of the flow of bile. In the modified form, described by C. H. Mayo, the rubber-banded portion of the catheter makes an excellent scaffolding on which to reconstruct the duct. It will remain *in situ* longer than the unbanded portion.

The author believes that when the stricture is found to involve practically the entire length of the duct, the surgeon has to be content either with establishment of an external biliary fistula, to be coned out and transplanted into the stomach or duodenum at a later time, or with insertion of a catheter or T-tube, one end in the intrahepatic duct and the other in the duodenum, and bridging the gap between with adjacent tissue, and occasionally with omentum.

Before transplanting such a fistula, it should first be ascertained that a stone of the common duct distal to it is not responsible for the fistula or that there is not sufficient common or hepatic duct remaining above the fistula that might be used for anastomosis of the duct to the duodenum, a procedure which produces better results than biliary-fistula transplantation.

If biliary-fistula transplantation is decided upon, the tract should be coned out, a considerable thickness of tissue being left around it, which allows the tract to remain attached to the liver. This is done to keep the fistulous tract open and to preserve its blood supply. As soon as the coned-out fistulous tract has been sufficiently mobilized, the nearest accessible portion of the stomach or duodenum is approximated and a stab wound is made into it at a favorable spot. A silk suture is passed through the end of the coned-out tract and this is brought through the opening in the duodenum or stomach and carried out again through the intestinal wall about 2.5 cm. lower, in the same manner as that used in urethral transplantation. The fistulous tract then should be pulled through the opening in the wall of the stomach or duodenum by the silk suture, which is so tied as to hold the end of the artificial duct inside of the lumen of the stomach or duodenum. Interrupted sutures then close the opening in the intestine around the tract and further protection is afforded by a small piece of omentum.

Both benign and malignant tumors of the bile ducts occur occasionally, and produce biliary obstruction. The benign tumors most frequently found are papillomas, lipomas, fibromas, xanthomas, and adenomas.

Malignant strictures of the bile ducts occur as a result of intrinsic carcinoma of the walls of the ducts or of extrinsic carcinoma arising in adjacent organs, most frequently in the pancreas but occasionally in the stomach and duodenum. Exact diagnosis in such cases, the author believes, is not of great importance except in an academic sense. As soon as the diagnosis of obstructive jaundice has been made and the moment is opportune, surgical exploration should be carried out. Tumors situated in either the right or left hepatic duct are usually not accessible for removal. The most that can be accomplished is curettage of a portion of the carcinoma until a flow of bile is obtained and then the long arm of a T-tube is inserted up past the growth for drainage purposes.

The author believes that for the surgical treatment of tumors of the cystic duct, cholecystectomy, with removal of the entire cystic duct, is the operation of choice.

Tumors involving the common bile duct, theoretically, can be treated by the same operation used for radical resection in the group of tumors previously mentioned, but in practice this is rarely feasible. When a tumor has involved the common duct, there is the advantage that cholecystenterostomy is usually possible, and sometimes this procedure offers more benefits than resection. Cholecystenterostomy is a much safer and a more satisfactory procedure; it will relieve the jaundice and pruritus and is preferable to hazardous radical resection.

Of the palliative operations, cholecystostomy or internal drainage by cholecystoduodenostomy, cholecystogastrostomy, or choledochoduodenostomy have long been the chosen methods of treatment.

The author defines cholecystenterostomy as essentially the same as any lateral anastomosis in which three rows of sutures are used. He says that the operation can be accomplished with or without the use of a Doyen clamp. If it is done without the clamp, a suction pump can be employed to empty the gall bladder and stomach of their contents. Before the stomach and gall bladder are opened, gauze packs should be inserted into the left and right subhepatic fossæ and the general peritoneal cavity to prevent leakage during the operation. The contents of the distended gall bladder are removed by means of a trocar and cannula which are introduced into this organ at a point at which the perforation can be included in the anastomosis. The gall bladder and stomach or the gall bladder and small intestine, either duodenum or jejunum, are approximated with either Doyen clamps or interrupted sutures at points immediately beyond what are to be the extremities of the anastomosis. A running silk suture through the serosa of the gall bladder and stomach or duodenum is used as the first row of sutures posteriorly. After this row has been inserted, an incision is made through the peritoneum and muscle of the gall bladder and stomach or bowel, and these tissues are approximated by a continuous suture of the packing type extending backward and joining the submucosa and mucosa. This suture controls bleeding from the posterior wall of the anastomosis. The same suture is continued across the anterior edge of the anastomosis as a running suture, the mucosa being everted. The second row of stitches anteriorly approximates the muscle and peritoneal layers and the third row anteriorly approximates the serosa of the viscera immediately beyond the second row. It may be advisable to place interrupted sutures at the angles, and portions of the gastrohepatic omentum may be used as a patch to cover the anastomosis. Tension on the anastomosis may be prevented when cholecystogastrostomy is required by attachment of the anterior wall of the stomach to the falciform ligai ment of the liver by a few interrupted sutures, it thus being kept to the right of the spinal column.

Transduodenal excision has been the most frequent method of removal of malignant tumors of the terminal portion of the common duct or of the ampulla of Vater.

Recurring attacks of pain simulating biliary colic and occurring subsequent to operations on the gall bladder are usually the result of stones which have been overlooked in the common bile duct. The other demonstrable causes of pain referable to the biliary tract are pancreatitis, stricture of the common bile duct, ulcers of the posterior duodenal wall which penetrate the pancreas, and biliary dyskinesia.

The management of patients suffering from abnormal function of the sphincter of Oddi and of the duodenum is still somewhat obscure. Good results have followed forceful dilatation of the sphincter of Oddi and prolonged drainage of the common bile duct with a T-tube. The author believes the safest

way to treat such patients is forcefully to dilate the sphincter of Oddi to a diameter of 8 mm., with a series of graduated scoops or sounds, and then to institute prolonged T-tube drainage.

The author thinks that visualization of the common bile duct by injection of roentgenologically opaque media into it through a tube placed in it at the time of operation has been of great value in reducing the incidence of recurring pathological change in the extrahepatic biliary tract.

Meyer-May, J.: "Attenuated" Pancreatitis (Les pancréatites attenuées). *J. de chir.*, 1939, 54: 174.

Meyer-May describes a form of pancreatitis—sometimes acute or subacute and sometimes chronic—which is little understood. The acute form is to be distinguished from acute hemorrhagic pancreatitis, the clinical and pathological characteristics of which are much better known.

At Hanoï, Tonkin, French-Indo China, 27 cases of this form of "attenuated" pancreatitis have been observed in which the symptoms were characteristic of pancreatitis; 9 of these cases were operated upon, and the diagnosis was confirmed. In addition a number of cases of gastroduodenal ulcer have been observed in which the symptoms indicated an involvement of the pancreas; 6 such cases have been studied recently. The chief symptoms of pancreatitis are: attacks of pain above the umbilicus, usually severe, which are increased by pressure and radiate toward the lumbar region; a rapid loss of weight; the inability to eat meat or fats; fetid stools; and dilatation of the transverse colon. Examination of the blood shows a definite hyperglycemia. Study of the duodenal contents obtained by the duodenal tube shows a marked deficiency of all the pancreatic ferments, especially of lipase. In the acute form, operation is often done at the time of the first or of recurrent attacks; all the 9 cases operated upon in the author's series were of the acute type. In the subacute type, the attacks of pain are less severe, but they recur often; the pain is increased by pressure in the region of the pancreas, and the patient loses weight rapidly. In the chronic form, there are repeated attacks of epigastric pain, not very severe, which often recur at long intervals; the stools are fatty, the appetite is poor, and there is a gradual loss of weight. In the author's cases of this type, the presence of intestinal parasites, usually the ascaris, was demonstrated. Roentgenological examination of the gastro-intestinal tract showed no lesion, and the gall bladder filled normally. In cases in which pancreatitis is associated with gastric ulcer, two types of pain are noted, the typical ulcer pain, and a more diffuse epigastric pain not related to the ingestion of food which occurs at different times of the day and also during periods when the ulcer symptoms are quiescent.

When the clinical symptoms suggest the presence of a pancreatic lesion, a study of the blood sugar to determine whether hyperglycemia is present, and an analysis of the duodenal contents for the pancreatic ferments should be made. When these tests support the diagnosis of pancreatitis, insulin should be given as a therapeutic test. Even in acute cases insulin may relieve the symptoms so that operation is not necessary. In subacute and chronic cases insulin is given in daily doses of from 15 to 45 units, under careful control of the blood sugar. When the blood sugar is reduced to and maintained at a normal level, the insulin treatment is stopped. Under this treatment, the pain and other symptoms are relieved, the patient gains weight, and analysis of the duodenal contents shows a marked increase in the pancreatic ferments. If operation is necessary in acute cases, the author advises careful exploration of the pancreas and the biliary tract, drainage of the gall bladder, which is generally distended, and closure of the wound without other drainage. Of the 9 patients treated by this method, 6 recovered.

In 4 of the acute cases of pancreatitis which were operated upon and in 6 cases associated with ulcer, biopsy of the pancreas was done. In these cases there was either diffuse edema with congestion of the blood vessels in the more acute cases, or sclerotic lesions, such as induration. In no instance were there hemorrhagic lesions or necrosis, which fact distinguished this type of pancreatitis from acute hemorrhagic pancreatitis. ALICE M. MEYERS.

Griessmann, H.: The Diagnosis and Treatment of Acute Diseases of the Pancreas. Report on 80 Cases of Acute Diseases of the Pancreas Observed at the Giessen Clinic During the Years from 1931 to 1937 (Zur Diagnose und Therapie der akuten Pankreaserkrankungen. Bericht ueber 80 in den Jahren 1931-37 an der Giessener Klinik beobachtete Faelle akuter Pankreaserkrankungen). *Deutsche Ztschr. f. Chir.*, 1939, 252: 19.

In recent years surgical intervention in acute pancreatitis has been put in the background and has given place to expectant treatment; that is, the diseases of the biliary tract underlying the disease have been operated upon only after the recession of the acute symptoms, in more than 90 per cent of the cases. The author reports on 80 cases observed at the Giessen Clinic during the years from 1931 to 1937, which were at first treated expectantly. In the years from 1909 to 1930, 74 cases were operated upon immediately after establishment of the diagnosis. In 50 patients there was an acute necrosis, and in 30 an acute edema. The increased frequency of the disease is attributed to the improvement in the conditions of nutrition during the period mentioned, and it should also be taken into consideration that the diagnostic procedures have been made more exact. In accordance with the much more frequent occurrence of disease of the biliary tract in the female sex, there is also a much more frequent occurrence of disease of the pancreas in this sex.

In 46 of the 58 cases operated upon, namely, in 79.3 per cent, small gall-bladder concretions were found, and in 7 only a solitary stone was found. No calculus was observed in only 5 cases. Only in 6.5

per cent of the cases did the common bile duct contain a stone; in 16.8 per cent a dilatation of the common bile duct was observed; and in 33.3 per cent jaundice was reported in the previous history as an expression of a disturbance in the biliary flow. The pancreatic complication occurred in the predominant majority of the cases with small concretions in the gall bladder, after a comparatively short duration of the basic disease. In 60 per cent of the cases which were operated upon extensive adhesions around the gall bladder were not observed. In one-half of the cases (41) the pancreatitis appeared in the first two years of the biliary-tract disease; a previous history was very rare.

Inasmuch as there may be no previous history or the general condition may make the diagnosis impossible, the diagnosis of pancreatitis must be established with the new methods, which is practically always possible. For this purpose there is first the demonstration of the increased amount of diastase in the urine, which is determined according to Wohlgemuth units. Only values above 256 are considered as being definitely increased. They must be determined by persistent examination—twice a day under certain conditions—and only then can so-called fermentation variations be excluded and definite conclusions drawn. Values exceeding 1,024 were found in 43.3 per cent of the cases of edema of the pancreas previous to the operation, and in 76 per cent of the cases of acute necrosis, and values exceeding 512 were found in 79.9 per cent of the former and in 84 per cent of the latter. In contrast to this, only 28.5 per cent of the cases of disease of the biliary tract alone showed values between 512 and 1,024 and 17.1 per cent showed higher values. Following a suitable operation on the biliary tract a rapid fall in the values was demonstrable: only 10.6 per cent of the cases of necrosis still showed an elevation above 1,024, and 6.8 per cent of the cases of edema showed a marked increase of the diastase, and this immediately after the intervention. However, it must also be emphasized that the test for diastase failed to give information in 18 per cent of the cases of necrosis and in 20 per cent of the cases of edema. For this reason the clinical picture must also be taken into consideration.

While the increased values for diastase may again rapidly sink to normal, this is not the case with the atoxyl-resistant lipase in the blood serum. The test is, therefore, carried out regularly, even though it is more troublesome and time-consuming, and under certain conditions it may show positive results also in diseases of the biliary tract and in gastric and duodenal ulcers perforating into the pancreas. In the latter cases, however, the high values obtained in pancreatitis are never achieved. The disturbances in the carbohydrate metabolism may become apparent in a spontaneous or alimentary appearance of glucose in the urine or in the elevation of the fasting blood-sugar above 120 mgm. per 100 c.cm. This elevation of the blood-sugar content was found present in the 70 cases examined for it, in 26.6 per cent of the cases of edema of the pancreas, and in 37 per cent of the cases of necrosis of the pancreas. Sugar was found in the urine only once in the first group and it was of the alimentary type. In the second group the spontaneous appearance of sugar was noted in 3 cases and in 9 cases it appeared in the alimentary form.

The functional blood-sugar test, proposed by Bernhard in 1926, with 50 gm. of glucose, showed entirely different results. In this test the blood-sugar content is estimated after forty-five, sixty, seventy-five, and one hundred and twenty minutes and is compared with the fasting blood sugar. With this test there is an increase both in the cases of edema and necrosis, which is always much higher in the latter, and the peak of the curve is observed in an average of sixty or seventy-five minutes. This weakened tolerance for sugar readjusts itself in edema after about five or six weeks. In 10 per cent of the cases operated upon because of necrosis of the pancreas diabetes was demonstrable in the functional glucose tests, and in an additional 10 per cent of the cases a weakened tolerance was demonstrable. In a follow-up investigation carried out recently on 22 patients who were operated upon, normal or almost normal blood-sugar values were observed in the functional tests. In one case only a slight increase in the blood-sugar content was found after eight years; in another case a considerable increased value (functional test) was found seven years later, but this value could be influenced dietetically to such a degree that after an additional eight years normal blood-sugar values were found. In a third case, normal values were still demonstrable fourteen years after the operation, while nineteen years later a fasting blood-sugar value of 154 mgm. per 100 c.cm. and a urinary sugar value of 5.4 per cent were found. Only the result of the functional blood-sugar test is to be considered as a definitely diagnostic sign.

In the presence of edema, an increase in the number of the white blood cells to figures between 15,000 and 20,000 was demonstrable in 72.4 per cent of the cases, and in cases of necrosis an increase to over 25,000 was demonstrable in 38.8 per cent of the cases. Hence the demonstration of a very marked increase of the leucocytes indicates the presence of the severe form of pancreatic disease. In the latter, there is also a marked increase of the urobilinogen as well as excretion of albumin and an increase of the residual nitrogen in the blood.

If the presence of disease of the pancreas has been recognized with the aid of all these diagnostic aids, the expectant treatment, with the avoidance of the administration of all fluids by mouth and in its place the administration of fluids by rectal drop infusions, should be begun. This is to be carried on for about three or four days and, in addition, atropine is given for the sedation of the vagus nerve, and morphine in large doses for the relief of pain. When the acute attack has passed, the operation on the biliary tract should be done as soon as possible, and for that reason the patient should remain in the hands of the

surgeon. As soon as the diastase values have become normal intervention should be made; there is no need for waiting for normal values of the blood sugar because these may be delayed for a long time. However, the circulation must first have definitely recovered. Eleven days was the average time which elapsed before operation. Under these precautions the operative mortality in cases of acute necrosis was reduced from 34 to 13 per cent. It should also be mentioned that in 0.1 of the operations carried out on the biliary tract without involvement of the pancreas necrosis of the pancreas developed (6:6,000 in a space of thirty-eight years).

(BUDDE). LOUIS NEUWELT, M.D.

Fiessinger, N., Bergeret, A., and Cattan, R.: Adeno-Epithelioma of the Body of the Pancreas; Surgical Excision; Cure (Adéno-épithéliome du corps du pancréas. Exérèse chirurgicale. Guérison). *Bull. et mém. Soc. méd. d. hôp. de Par.*, 1939, 55: 729.

A forty-two-year-old woman had suffered for about six months with vague gastro-intestinal symptoms. Medical examination revealed a mass in the epigastrium, which was assumed to be the hypertrophied left lobe of the liver, in view of the incidental finding of amebas in the stools. However, with increasing loss of weight and failure of response to amebicides, a more careful examination including x-ray studies (Fig. 1) revealed a tumor mass pressing up behind the lesser curvature of the stomach. About eight months after the onset and the institution of varied treatments surgical intervention was decided on. Under spinal anesthesia, supplemented by nitrous oxide, a well demarcated tumor was extirpated from the tail of the pancreas (Fig. 2). Histological study showed it to be a cylindrocubic epithelioma.

Fig. 1. Roentgenogram of the stomach; (AP) deformity of the lesser curvature caused by the tumor pressure.

Fig. 2. Macroscopic aspect of cut section of the tumor.

A perusal of the literature indicates the extreme rarity of the condition. It is most unusual for a cancer of the body of the pancreas to be palpable through the abdominal wall. Some authors speak of "encysted epithelioma" in describing such cases. The authors suggest that the present case was a pancreatic adenoma with secondary malignant degeneration. In the entire literature only 5 cases of epithelioma of the body of the pancreas with attempt at surgical removal have been found. Three of these patients survived more than two years; 1 of them died nineteen years later of bronchopneumonia. It seems that certain forms of cancer of the body of the pancreas are readily extirpated surgically and offer a favorable prognosis.

The authors present a detailed discussion of the operative findings, histology, and general literature.

JACOB E. KLEIN, M.D.

GYNECOLOGY

UTERUS

Horálek, F.: The Cause of Retroflexion of the Uterus (Zur Aetiologie der Retroflexio uteri). *Verhandl. d. internat. Kong. f. Geburtsh.*, 1938, 2: 58.

According to the view of the author, retroflexion of the uterus is no disease in itself, but only a symptom of derangement of the sympathetic nerve tone. The pelvic nerve is responsible for the tone of the cervix. If it is blocked by lumbar anesthesia, a relaxation of the cervix and an increase in the extent of the fundus tone occur. On the other hand, a chronic hypertonicity of the cervix coincident with a permanent atony of the fundus may produce a retroflexion because the round ligaments are also relaxed. This is caused by excessive parasympathetic stimulation of the cervix and is regarded as an acquired essential imbalance of the sympathetic nerve tone. The following is given as proof of this statement.

In the course of laparotomies done under lumbar anesthesia for the correction of retroflexion, the uterus is regularly found in the normal position, and reposition is best obtained following sufficient manipulation to cause the fundus to contract. After the administration of belladonna suppositories and the quieting of the over-wrought parasympathetic nerve, retroflexion is more easily corrected, just as correction of retroposition is easier when the intestine and urinary bladder are emptied before the cervix is dilated. The atony of the fundus ceases in all of the cases. Retroflexion may be an expression of general hypotonicity of the sympathetic system caused by increased tone of the cervix. All of the cervical trauma and laceration of childbirth act to further this result. They lead to chronic atony of the fundus and retroflexion. Congenital retroflexion is thus understood to be an expression of the lack of normal sympathetic tone due to an immature organ. Treatment of the retroflexion should consist of belladonna therapy, relief of the congested circulation, and improvement of the sympathetic tone with diathermy, warming of the feet, and various pharmacological agents. The healing of cervical erosions with the electrocautery may also prove of value. Operative treatment is permissible only after conservative measures have failed and the surgeon is convinced that no underlying factors have been overlooked, as it is to be regarded only as a supportive measure and is not directed at the underlying cause. (Redenz). August Jonas, Jr., M.D.

Van Gulik, P. J.: Martzloff's Grading of Squamous-Cell Cancers of the Collum Uteri, with Regard to Prognosis and Irradiation Treatment. *Acta radiol.*, 1939, 20: 276.

Of 180 patients with squamous-cell carcinoma of the cervix uteri, all of whom were treated only by irradiation in the Antoni van Leeuwenhoeckhuis Hospital of Amsterdam, 66, or 36.6 per cent, showed five-year cures. Martzloff's system of grading was employed in studying the histological sections. (The predominant cell type of the malignancy determines the grading.) Starting from the normal epithelium of the portio, one sees 3 distinctive cell types: (1) the outer layers of large polyhedral cells with distinct cell membranes and intercellular ridges (spinal cells); (2) a thin layer of small, roundish cells (transitional cells); and (3) the basal layer, with deep-staining oblong nuclei (spindle cells).

In general, irradiation technique is as follows:

In the course of from two to three weeks, 4,500 mgm. hr. of radium element are given to the portio, and about 2,400 mgm. hr. are given in the canal, in three or four sessions of about thirty hours. In this period roentgen therapy is started, and the pelvis is irradiated from four external fields of 15 by 15 cm. Six weeks after the first series of treatment, a second series of roentgen treatment, equal to the first, is given, i.e., a total of 8,000 roentgens. Occasionally radium needles are inserted into the remaining tumor by means of laparotomy.

Grading of squamous-cell carcinomas, with regard to their prognosis and treatment with radiant energy, was rather disappointing. It was of no use for individual prognosis, but may be of some value for groups. The relative radiosensitivity of the Grade III cancers is offset by their tendency toward early metastasis, and the grading of such carcinomas might be appreciated more if one could detect metastases sooner. E. S. Burge, M.D.

Healy, W. P., and Brown, R. L.: Experience with Surgical and Radiation Therapy in Carcinoma of the Corpus Uteri. *Am. J. Obst. & Gynec.*, 1939, 38: 1.

Carcinoma of the corpus uteri is, in most instances, a postmenopausal disease, and uterine bleeding is its most constant symptom. Postmenopausal bleeding should at once suggest the presence of carcinoma of the corpus even though the patient has a readily palpable fibromyomatous uterus. These two conditions were found to be associated in 38 per cent of the cases in this series.

Pain would appear to be an important prognostic factor. Sixty-six per cent of the patients complaining of pain at the time of first examination died of carcinoma later. In nearly half of these, initial examination revealed no evidence of extension of the carcinoma beyond the uterus. The 197 cases of carcinoma of the corpus uteri on which this study has been based fall readily into three principal histological groups.

Approximately one-half of all the cases presented adenoma malignum, one-fourth adenocarcinoma Grade II, and approximately one-fourth adenocar-

cinoma Grade III or IV. The histological type bears a direct relation to the chance for cure and is of definite prognostic importance. The five-year survival rate for adenoma malignum is appreciably higher than that for adenocarcinoma Grade II, and this survival rate for adenocarcinoma Grade II is higher than that for adenocarcinoma Grades III and IV. The results in a small series of cases of adenoacanthoma indicate the prognosis in this group to be nearly equal to that in adenoma malignum.

It appears worthwhile from both a prognostic and a therapeutic standpoint to subdivide the cases into clinical groups according to the size of the uterus and the palpable extent of the disease. If the uterus is not larger than the size of a two and one-half months' gestation and if there is no evidence of extension of the carcinoma beyond the uterus, the five-year survival rate is 60 per cent if it is based upon the entire series of 197 cases without regard to method of treatment; if it is based on results in a smaller series of cases treated according to what is regarded by us as the preferred method of treatment it is 88 per cent. If the uterus is larger than a two and one-half months' gestation, our findings indicate that the chance for cure from radiation alone is extremely low. If there is palpable extension of the carcinoma beyond the uterus, the chance for five-year survival is approximately 10 per cent.

Radiation alone has definite curative value in cases which, for one reason or another, cannot be subjected to subsequent panhysterectomy, the five-year survival rate for the group of 96 patients treated by radiation alone being 39 per cent. When only clinical Groups I and II are considered, the five-year survival rate is 56 per cent and the five-year cure (free from all evidence of carcinoma for five years or more) is 47 per cent.

Intra-uterine radon, usually not less than 3,600 millicurie hours, supplemented by roentgen ray treatment and followed by panhysterectomy seems to offer the greatest opportunity for cure. Seventy-nine per cent of the patients so treated have survived five years or more and 75 per cent have been free from all evidence of carcinoma for more than five years. The risk of major complications seems slight. EDWARD L. CORNELL, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Fauvet, E.: The Enlarged Ovary (Ueber das grosse Ovarium). *Arch. f. Gynaek.*, 1939, 168: 414.

Seven cases of ovaries larger than normal are described. They are classified according to the views of Bartel and Hermann who distinguish between the ovary which is larger than normal because of an increased amount of connective tissue, which is therefore not of functional importance, and the ovary which is enlarged because of cystic follicles.

In the first case reported, an ovary of a sixteen-year-old girl was interspersed with vesicular follicles. According to the author, the diagnosis of cystic degeneration for this ovary should be challenged inasmuch as only a temporary condition was found to be present.

Cases 2 and 3 presented ovaries in which an edema of the ovarian stroma had occurred as a consequence of para-ovarian cysts so that the entire ovary was enlarged.

Case 4 was that of a thirty-year-old woman who had died of eclampsia, and in whom the ovaries were filled with vesicular follicles. Of special significance in this case was the presence of a large corpus luteum, in spite of which there was a striking development of vesicular follicles. This occurrence is not possible according to the theory of Stieve.

In the fifth case both ovaries were removed from a twenty-year-old girl because of the diagnosis of malignant tumors. Both ovaries consisted almost entirely of connective tissue. All stages of rapidly growing and degenerating follicles were found, but no corpora lutea. The scar formation was responsible for the ovarian enlargement and gave the false impression of a tumor.

The last case was that of a twenty-five-year-old woman from whom one ovary had been removed on suspicion of a fibroma and the larger portion of the other ovary resected for the same reason. Microscopically there was no sign of tumor formation, but the condition was one of enlarged ovaries. The remainder of the ovary left *in situ* later underwent cystic degeneration and was removed.

(FAUVET). RONALD R. GREENE, M.D.

MISCELLANEOUS

Heiberg, B.: Positive Friedman Reaction in a Case of Corpus-Luteum Cyst. *Acta obst. et gynec. Scand.*, 1939, 19: 176.

The author reports the case of a woman twenty-five years of age, who presented symptoms of extra-uterine pregnancy. The Friedman reaction was positive. On laparotomy, the lesion was found to be a corpus-luteum cyst. There were no signs of concurrent pregnancy. On the basis of this case and other cases in the literature, mention is made by the writer of the differential diagnostic difficulties between the two lesions.

A positive Friedman reaction, taken as a positive reaction for pregnancy, may occasionally be misleading, as the urine of patients with corpus-luteum cysts may give a positive reaction to this test. The question is discussed as to whether the pituitary gland is involved in the pathological processes. In the case here reviewed, the rate of metabolism was increased. This, together with the positive Friedman reaction, and perhaps the very formation of the corpus-luteum cyst, constituted the only symptoms of deficiency in the balance of the endocrine system.

The positive Friedman reaction is due nearly always to excretion in the urine of a hormone produced by chorionic tissue. Under normal conditions, it is true that the pituitary gland produces hormones that may give the same reaction; but the excretion of these hormones with the urine is so slight that

the reaction fails to appear for quantitative purposes. However, in certain abnormal cases associated with a hyperproduction of gonadotropic hormones, for example, in ovarian dysfunction, a positive Friedman reaction may be obtained as an expression of an abnormal state of the pituitary gland, and not, as usually, an expression of hormone production by chorionic tissue in the organism of the patient. Such a reaction may be mistaken for evidence suggestive of the diagnosis of pregnancy.

The author notes that a positive Friedman reaction may appear also in patients suffering from a dermoid cyst of the ovary.

A review of the few cases collected from the literature reveals what is shown in the case reported herewith—that there is one more group of ovarian cysts, viz., the corpus luteum cysts, in the presence of which the urine of the patient may give a positive Friedman reaction. HERBERT F. THURSTON, M.D.

Turpault: The Use of the Male Hormone in Women, with Particular Reference to the Treatment of Hemorrhage (L'hormone male chez la femme spécialement dans les hémorragies). *Gynécologie*, 1939, 38: 281.

Turpault has used testicular extracts since 1931, but with the isolation of the crystallized product (testosterone), in 1935, he began to use this more powerful drug. The formula is given as $C_{19}H_{28}O_2$. Testosterone tends to decrease the action of the ovarian and hypophyseal hormones, and through the use of as much as from 50 to 60 mgm. a month the author has attained good results in the control of uterine bleeding in the so-called "functional" cases of hemorrhage. He has also had successful results by the use of testosterone in hemorrhage caused by fibroma, with doses of from 50 to 500 mgm. a month.

The conditions in which testosterone is indicated are: diseases of the breast, uterine fibroma, functional uterine hemorrhage (especially during puberty or at the menopause), intermenstrual crises, uterine hyperplasia, nervous upsets (either menopausal or sexual), and menopausal difficulties, whether caused by surgical or radium treatment, or by natural changes.

The author advises that the testosterone be given two or three days before the expected appearance of the symptoms. There are some inconvenient effects from this drug, such as (1) fatigue, (2) excitement, (3) involvement of the liver, (4) the rare occurrence of vocal changes, in which the voice becomes lower in pitch, and (5) development of the clitoris.

FREDERIC W. ILFELD, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Strauss, M. B.: The Toxemia of Pregnancy. *Am. J. Obst. & Gynec.*, 1939, 38: 199.

The term "toxemia of pregnancy" is a misnomer. Approximately 85 per cent of the cases so classified are cases of primary vascular or renal disease. In such cases, changes in the water balance do not affect the signs or symptoms. A large proportion of the remaining 15 per cent are cases in which the patients are suffering from water retention. This may be due primarily to low plasma proteins or to excessive sodium intake, or, in many instances, to both factors. Measures which lead to further water retention increase the severity of the "toxemic" manifestations, whereas measures which result in the loss of excessive retained water result in an amelioration of these manifestations. A low sodium intake is one means of eliminating undue water retention. The development of water-retention toxemia may be prevented by the maintenance of the pregnant woman's plasma proteins at a normal level with an adequate diet and the avoidance of excessive sodium ingestion.

In the discussion, TILLMAN states that he does not agree with the view that the edema is responsible for the toxemia. Hypoproteinemia frequently results from the loss of protein through the kidneys, in addition to the factors mentioned.

STANDER has been unable to convince himself that a reduction in the total serum proteins is responsible, in many cases of pre-eclampsia, for the marked increase in body weight due to water retention. There appears to be enough evidence at present to ascribe to the sex hormones an ability to regulate, in part at least, the excretion of certain of the inorganic ions, Na, K, and Ca, as in the case of the adrenal cortex hormone or hormones.

EDWARD L. CORNELL, M.D.

Dieckmann, W. J., and Brown, I.: The Obstetrical Management of Patients with Toxemia. *Am. J. Obst. & Gynec.*, 1939, 38: 214.

The average maternal mortality in representative hospitals for non-convulsive toxemia of pregnancy is 1.7 per cent. The mortality reported by the authors for preventable deaths is 0.4 per cent. One-half of the immediate deaths were due to infection; the remainder to heart disease and/or anemia.

More than 13 per cent of the toxemic mothers were discharged without a living baby. Seventy per cent of the dead fetuses weighed less than 2,500 gm., but this group comprised only 20 per cent of the series. The fetal mortality for all fetuses weighing more than 1,000 gm. was 8 per cent; more than 1,500 gm., 6 per cent; and more than 2,500 gm., 3.9 per cent. Toxemia does cause an increased fetal mortality.

Cesarean section yielded the lowest mortality for fetuses weighing from 1,000 to 1,999 gm. (31 per cent), and for those weighing more than 4,000 gm. (0 per cent). The mortality for viable fetuses was 12 per cent.

Normal labor gave the lowest mortality for fetuses weighing from 2,000 to 3,999 gm. (3 per cent). The mortality for viable fetuses was 5.2 per cent.

Induction of labor gave a high mortality in all weight groups and is now used only in selected cases.

The fetal and neonatal mortality for the first five years was 15.5 per cent, and for the last two years 7.2 per cent. Similarly, the mortality for fetuses weighing more than 1,500 gm. was 6.8 per cent for the first five years, and only 2.3 per cent for the last two years.

Labor should be induced only in suitable cases; that is, there should be no cephalopelvic disproportion, the fetal position should be a normal one, and the cervix should be "ripe" (effaced, soft, and dilatable). Rupture of the membranes and, if contractions have not started at the end of twelve hours, the injection of 1 or 2 minims of pitocin at thirty-minute intervals until uterine contractions occur every three or four minutes, or until 8 doses have been given, is the safest method. Occasionally, when rapid delivery seems imperative, a bag may be inserted within the uterus.

Cesarean section should be used only in the pre-eclamptic patient when eclampsia seems imminent and delivery through the vagina seems unwise. It is also indicated in the interest of the baby, in patients with essential hypertension or vasculorenal disease, if delivery is necessary before term and the cervix is not "ripe." Sterilization as an indication for the operation is unwarranted.

The morbidity for all patients amounts to 7.8 per cent, but for toxemic patients alone, the morbidity is 32 per cent. This high incidence of fever is due primarily to the excessive vaginal manipulation and the high operative rate in toxemic patients.

The duration of labor in toxemic patients is longer than normal.

The weight gain in normal pregnancy should amount to the weight of the products of conception and of the physiological changes associated with pregnancy.

The weight of the fetuses from toxemic patients is, as a rule, less than the average for the period of pregnancy. These babies are immature rather than premature and are usually much more vigorous than their weight warrants. A high carbohydrate diet during early pregnancy may be of value in producing a larger fetus in patients with vasculorenal disease.

No drugs which depress the respiratory center such as morphine, hyoscine, ether, and paraldehyde should be used before delivery if the pregnancy is

being terminated prematurely. Magnesium sulfate or sodium luminal may be given intramuscularly if convulsions seem imminent. Analgesia may be obtained with intermittent gas anesthesia. Episiotomy is especially indicated in the delivery of the premature baby.

Prenatal care should be intelligently administered, in order that abnormalities of weight, blood pressure, and urine may not only be recognized, but their importance appreciated and proper treatment instituted. EDWARD L. CORNELL, M.D.

Dix, V. W., and Evans, H.: Ureteric Catheterization in Pyelitis of Pregnancy. *Lancet*, 1939, 237: 176.

From 1934 to 1937 at the London Hospital, 84 cases of pyelitis of pregnancy were admitted. One of the postnatal and 7 of the prenatal patients did not respond to the ordinary medical treatment with adequate fluid, bed rest, and alkali. Five of them had such severe vomiting that oral administration of the drugs was impossible. Ureteral catheterization was used successfully in all 8 cases, and in each instance it was the right kidney pelvis which was drained.

A rapid and striking regression of the symptoms and signs followed the mechanical drainage, and in no case was it necessary to interrupt pregnancy. The catheter was left *in situ* for three or four days, and the authors believe that an even shorter time might well be employed with but slight extra risk of recurrent stasis. In no case was it necessary to repeat the procedure.

The treatment with alkali was continued during and after catheterization, and it is pointed out that although probably no medication would have helped during the acute stage, the sulfanilamide and mandelic acid-groups may be very helpful in clearing up the residual infection. Unless the remaining infection is carefully attended, recurrence is, of course, quite probable.

No anesthetic was used during the cystoscopies, but one must remember that especially when the fetal head is in the pelvis, expert manipulation is paramount, and an anesthetic may be indicated.

E. S. BURGE, M.D.

LABOR AND ITS COMPLICATIONS

Consoli, D.: Cervical Dystocias (Le distocie cervicali). *Arch. di ostet. e ginec.*, 1939, 3: 193.

Consoli thinks that it is advisable to classify dystocias of the cervix into anatomical dystocias, due to congenital or acquired causes, and functional dystocias, in which the alterations occur during labor.

The first type (anatomical, organic, and static) may be due to: (1) congenital rigidity which may be constitutional or caused by defects in form; (2) acquired rigidity having a pathological cause, such as generic or specific inflammatory processes (gonorrhea and syphilis), neoplastic processes (fibroma, cancer, and previous labors), and cicatricial processes due to surgical intervention (trachelorrhaphy and amputation of the cervix), and to chemical agents (potassium permanganate and Filhos caustic), or physical agents (radium and diathermocoagulation); (3) longitudinal hypertrophy and coherence of the cervical borders; (4) results of interventions on the uterus; (5) ventrofixation and hysteropexy; and (6) deviations of the cervix.

The second type (functional and dynamic) may be due to: (1) defective adaptation of the presenting part and total or essential uterine dyscinesia, either primary or secondary; (2) cervicosegmental, or high cervical spastic condition, either total or partial; (3) low cervical spastic condition, either total or partial; and (4) edema of the cervix.

The frequency of occurrence of cervical dystocia necessitating surgical intervention amounts to 1.17 per cent, and its total frequency is consequently much higher. The course of uterine contractions is greatly altered in cervical dystocia, in some cases from the beginning of labor and in others during some phase of labor, and the changes in the cervix vary according to the cause of the dystocia. For instance, in spasm of the external orifice, the cervix is well flattened and the borders of the orifice offer an abnormal resistance to attempts at digital dilatation; in cervicosegmental dystocia, the spastic circle is felt above the external orifice or at the level of the internal orifice under the form of a diaphragm or a spur. Premature rupture of the membranes occurs frequently in cases of cervical dystocia and is caused by abnormal adhesions of the membranes to the cervix.

Prophylaxis includes all the gynecological measures to be taken in the presence of any inflammatory, neoplastic, and cicatricial disorders, such as early and thorough treatment of infections and tumors, immediate repair of lacerations, avoidance of mutilating interventions (the preference going to plastic repair), and the cautious use of chemical and physical agents. In functional dystocia, incorrect and brutal vaginal attempts at manual dilatation must be condemned. The prognosis of the dystocia can be given only approximately after observation of the development of the course of labor and consideration of its various individual elements.

The treatment rests on the same foundations and, depending upon the individual case, will consist of expectation with attempts at medical therapy, or active intervention by the vaginal route (artificial dilatation of the cervix and extraction of the fetus), or by the abdominal route (cesarean section). In primary hyperkinetic cases, the medical treatment should include the administration of anti-spasmodic drugs, without the exaggerated use of opiates. In hypokinetic cases, anti-spasmodic drugs are indicated for the slow and nearly continuous molestation of slight contractions with a feeling of pulling in the lumbar region and the lower abdomen. Stimulating drugs, especially in the beginning of labor, are dangerous. It is rarely necessary to take recourse to artificial rupture of the membranes, but there are

exceptional cases in which the integrity of the membranes clearly prevents dilatation of the cervix. In case of adhesions between the cervix and the amniotic sac, it is advisable to separate them cautiously while keeping the membrane intact.

RICHARD KEMEL, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Brown, C. E., and Eder, L. F.: Acute Puerperal Hypophyseal Necrosis, with the Report of a Fatal Case. *Am. J. M. Sc.*, 1939, 198: 166.

Acute necrosis of the anterior lobe of the pituitary gland in parturient women is not common, but Sheehan in 1937 reviewed the literature and added 11 cases from the Royal Glasgow Maternity Hospital, in which death followed delivery after a period of from fourteen hours to thirty days.

The authors report the case of a patient who died ninety-three hours post partum, in whom the only apparently significant finding at autopsy was acute thrombosis and necrosis of the anterior pituitary lobe. The prominent symptoms were, first, nausea and vomiting, probably explained by an ileus which was completely relieved with a Levine tube by forty-four hours after delivery. The general condition of the patient did not improve. She was restless, confused, and complained of severe headache. On the third day, in spite of continued adequate intravenous fluids, a second blood transfusion, and ephedrine, the systolic pressure stayed below 90, and on the fourth and last day the blood pressure readings dropped as low as 50/20. She became drowsy and cyanotic, and extreme hypotension persisted until death. The fluid output was concomitant with an adequate intake, and on the last day the blood picture was: red blood cells, 4,100,000; hemoglobin, 82 per cent, and white blood cells, 15,000.

The local irritation and endocrine deficiency resulting from the above anatomical lesion may well explain the salient features of headache and hypotension. It is suggested that this condition may be a more common puerperal complication than is generally recognized. Should the puerperal course of a woman progress unfavorably without apparent cause, the authors suggest the possible efficacy of blood-sugar studies, active glucose therapy, and the administration of anterior pituitary extracts.

E. S. BURGE, M.D.

VESICO-INTESTINAL FISTULAS

A Review of the Literature, Including 21 Cases of the University Hospital

HARRY PETERS, Jr., M.D., San Francisco, California

VESICO-INTESTINAL fistulas are relatively infrequent, though reports go back for many years. As early as the second century the Ephesian physician, Rufus, mentioned that Praxagoras had seen a case of vesico-intestinal fistula. In the seventeenth century the German practitioner, Schenckius of Freiberg, observed in a fellow physician a case of an enterovesical fistula secondary to a sigmoidal neoplasm. In the same century, the Italian physicians Cardano and Beniviene independently reported similar cases. A short time later other cases were added by Boyer, De Sault, and Chopart. One of the first accurate and authentic descriptions was given by Frank in 1786. Sydney Jones's case in 1858 was a vesico-intestinal fistula on the basis of diverticulitis, and was confirmed by autopsy. There were, thus, only a few isolated reports prior to Blauquinque's article "Fistules Vesico Intestinales" in 1870.

It was not until 1885 that a comprehensive study on this subject appeared in the form of "The Passage of Air and Fecal Matter with the Urine," which was written by the famed physician Harrison Cripps. He expounded on the 63 cases he was able to collect and many of the principles and facts as set forth by him remain unchanged to this day. Sporadic works appeared subsequent to Cripps' monograph; Chavanney, in 1897, presented an excellent treatise, and Pascal, in 1899, wrote a review based on his survey of 286 cases. Shortly after this, interest was aroused in the American and British surgeons, and such names as Parham, Hume, Chute, McKenna, and Judd became prominent. Heine's paper, in 1904, was one of the first to accentuate the importance of diverticulitis in the etiology of these fistulas. Prestavecco's search of the literature in 1912 yielded but 42 cases to add to those collected by Pascal. In 1915, Cunningham's paper brought the subject matter fairly well up to date, and no major contributions have been made since that time. In 1926, 433 cases were collected by Albano and additional reports followed by Lockhart Mummery, Norburg, Dobson, Moir, Willan, Leland, Goetsch, and Colby, totalling 573 cases up to 1936. Higgins' 35 cases, Balch's 19, and 21 from the University of California Clinic,[1] with the addition of isolated case reports since 1936, make a total of slightly over 600 cases available for study.

It will be noted that there is a discrepancy between the number of cases reported in the literature and those considered in this study. This discrepancy arises from the fact that many cases were incompletely followed up, or insufficient information was included in the reports to warrant their use. In this paper an attempt has been made to offer an unbiased summary of accurate clinical data appearing in the literature.

SEX AND AGE

Reports vary considerably regarding the occurrence in the two sexes. Cunningham reported the incidence as 3 in females to 1 in males. Conversely, Pascal, Bryan, and Higgins each reported a predominance in males in the ratio of 3 to 1. Of 542 cases analyzed in this paper, 381, or 70 per cent, occurred in men and 161 cases, or 30 per cent, in women.

The incidence was found to be greatest in the sixth decade, the ages varying from birth to seventy years, with an average age of fifty-one years.

ETIOLOGY

A review of the literature and a compilation of 463 cases, the etiology of which was reasonably assured, made Table I possible.

The congenital cases, of which 25 appear in the literature, are confined to imperforate anus. These constitute 7 per cent of the total.

Fistulas resulting from trauma constitute 19 per cent of the total. Surgical manipulation accounts for almost one-half of these cases. Of the non-surgical or accidental causes, gunshot wounds play the predominant rôle.

As is well borne out in the literature, vesico-intestinal fistulas are most often caused by inflammatory processes, and true diverticulitis constitutes the cause in more than two-fifths of the cases. The incidence of diverticulitis has been

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[1]See end of article for detail of these cases.

TABLE I.—CASES OF VESICO-INTESTINAL FISTULAS

	Number of cases	
I. Congenital		25
A. Imperforate anus	25	
II. Traumatic		87
A. Postoperative accidents including litholapaxy, uterine curettage, vaginal hysterectomy, catheterization, prostatectomy, and radium burns	39	
B. Gunshot wounds	37	
C. Childbirth	8	
D. Penetrating wounds of the rectum	2	
E. Fractured pelvis	1	
III. Inflammatory		246
A. Diverticulitis	104	
B. Tuberculosis (intestinal, tubal, vesical, seminal vesicular, and prostatic)	37	
C. Ulceration of foreign body from the bowel into the bladder, including fish bones, gall stones, pencils. (In 2 of these cases the communication was through the appendix.)	31	
D. Appendiceal abscess	22	
E. Ulceration of vesical calculus into the bowel	16	
F. Neisserian tubal abscess	14	
G. Diverticulum of the bladder	7	
H. Syphilis	5	
I. Actinomycosis	3	
J. Prostatic abscess	2	
K. Perineal abscess	2	
L. Typhoid	2	
M. Meckel's diverticulum	1	

Amebiasis, bilharziasis, echinococcus disease, regional enteritis, and ulcerative colitis were mentioned in the literature but these cases were not included in this report for want of sufficient proof.

IV. Tumors		105
A. Carcinoma of the rectum	37	
B. Carcinoma of the sigmoid	32	
C. Carcinoma of the bladder	14	
D. Carcinoma of the cervix	8	
E. Carcinoma of the uterus	7	
F. Carcinoma of the prostate	2	
G. Carcinoma of the vagina	2	
H. Carcinoma of the ovary	2	
I. Carcinoma of the cecum	1	

reported to vary anywhere from 14 to 50 per cent. Diverticulitis was established as the cause in 23 per cent of the 463 cases reviewed in this paper. In the inflammatory group, tuberculosis, the ulceration of a foreign body from bowel to bladder, and appendiceal abscess appear in the order named. Though the importance of tuberculosis is emphasized in the literature, it constitutes but 8 per cent of the total in this report, ranking about equally with surgical accidents and gunshot wounds.

In this series, the vesico-intestinal fistulas secondary to neoplasms were caused by carcinoma. Carcinoma of the rectum was the chief offender and accounted for over one-third of these cases. Carcinoma of the sigmoid was responsible in fewer than one-third of the cases, with carcinoma of the bladder next in frequency. Malignant involvement of the rectum and sigmoid, together, constituted 15 per cent of all the cases recorded. In our own series of 21 cases, 2 followed the use of radium, and it is suspected that a greater number of these occurred during the period of enthusiastic radiation than is evident in the literature.

In surveying the foregoing figures, then, diverticulitis is seen to be the most frequent individual etiological agent, with carcinoma of the rectum and sigmoid, surgical accidents, and tuberculosis occurring in the order named.

TABLE II.—LOCATION OF VESICO-INTESTINAL FISTULAS

Between	Number of cases	Per cent
Rectum and bladder (including rectosigmoid)	218	44
Sigmoid and bladder	113	22
Colon and bladder	84	18
Small intestine and bladder	44	9
Appendix and bladder	27	5
Cecum and bladder	13	2

PATHOLOGICAL CHANGES

Table II shows the incidence of location in the 499 cases in which the site was determined:

The fistulous tract between the bladder and the intestine may be direct or indirect via a tortuous sinus. The direct communication is usually found in carcinoma and tuberculosis, whether primary in the bladder or the bowel. The tortuous tract occurs secondary to abscess formation with openings into the organs at different levels as is usual in diverticulitis.

The opening into the bladder is usually found in the region of the trigone, more commonly on the left side because of the proximity of the sigmoid, less commonly on the posterior wall, and least often on the fundus. The inflammatory changes in the bladder depend upon a number of factors: the size of the fistulous opening, the amount and character of the rectal contents passing into the bladder, the presence or absence of urethral obstruction, and the type of infective organism. The pathological findings in the bladder are discussed in detail under the cystoscopic findings in the section on diagnosis.

SYMPTOMS

The symptoms of vesico-intestinal fistulas can best be discussed in phases: the cardinal symptoms, those coincidentally present, and those arising from the primary etiological lesion.

All texts mention 3 cardinal symptoms. In the first, that of pneumaturia, manifestations present are the passing of gas along the urethra, bubbles in the urine during voiding, and froth at the meatus after the act is completed. Pneumaturia is most prominent when the large bowel is affected by the fistula. In itself, pneumaturia is not pathognomonic and the following conditions should be ruled out: glycosuria associated with fermentative organisms, recent vesical instrumentation, as with a cystoscope, and certain neurogenic atonic dilatations of the bladder.

The second cardinal symptom is the passage of feces by urethra. This complaint, like that of pneumaturia, is almost invariably present. Variation is wide, depending on the size of the communication and the portion of the bowel involved in the fistula.

The third cardinal symptom is the passage of urine by rectum. This was present more often than expected, occurring in about one-third of the cases. It depends somewhat on the size of the fistulous communication, the presence of obstruction in the lower urinary tract, and the association of a long-standing cystitis with compensatory hypertrophy and increased intracystic pressure. The single direction of flow is borne out by the fact that opaque dye by rectum will frequently outline the fistula, whereas cystograms usually fail. The symptoms of the presence of urine in the rectum are those of proctitis, and the toxic effects from absorption are minimal unless the communication is with the small bowel.

A long train of coincidental symptoms may be present. Those most common are secondary to the cystitis and consist of frequency, burning, terminal hematuria, and tenesmus if the fecal particles are firm. A foul smell to the urine may be noticed by the patient and a peculiar roaring in the bladder is not infrequently present. Such general symptoms as mental anxiety, insomnia, loss of weight, and exhaustion may be present. Many of the foregoing symptoms may exist in the prefistulous stage if a primary lesion of the bowel is in close apposition to the bladder.

No discussion is indicated regarding the multiplicity of complaints and variations in the clinical picture as caused by the original lesion. Suffice it to say, a careful history usually reveals a vesical or enteric affection previous to the time of perforation. Familiarization with the history is important both from the standpoint of treatment and that of prognosis.

Seminal vesiculitis, epididymitis, and fecal vesical calculus are among the more frequent complications. Ascending pyelonephritis, with its chain of symptoms of chills, fever, pain in the flank, and renal damage should the parenchyma be involved, is peculiarly uncommon. In only 18 of Pascal's 250 cases did this occur and the condition was bilateral in 14 of these 18 cases. Chavanney stated that renal infection is not usually found because the bladder maintains control over its infection and colon bacilli introduced through the fistula are less harmful to their host than when distributed by the blood stream.

DIAGNOSIS

As can be seen, the diagnosis can often be made with no data further than the history. The physical examination, nevertheless, is important as an aid in the determination of the nature of the primary lesion. The finding of an active tuberculous lesion may be an important lead; the presence of a mass in the right lower quadrant, verified perhaps by rectal examination, leads one to suspect an appendiceal abscess, carcinoma, or tuberculosis of the cecum. Likewise a mass in the left lower quadrant is suggestive first of diverticulitis of the rectosigmoid. Rectal malignancies are often within reach of the examining finger. A tender mass associated with fever and leucocytosis makes an indirect fistula from an abscess probable. General distention of the colon suggests stenosis, benign or malignant, while distention with peristalsis of the small bowel suggests involvement of a loop of the small bowel.

Of even greater importance for an accurate diagnosis are the laboratory procedures at hand. Routine Wassermann test, complete blood count, and examinations of the urine and stool should always be made as well as tests of the kidney function. Most pertinent is cystoscopic examination, combined with sigmoidoscopy, barium enema, and cystographic studies. Before the fistula has developed, but after the inflammatory tumor has become adherent to the bladder, a localized area of edema with papillomatous-like projections of the mucous membrane is usually present in the bladder and may be recognized at cystoscopy. The fistula once established, the orifice is most commonly found in the trigonal region, especially to the left of the trigone. It may be relatively close to the ureteral orifice, at times making catheterization difficult. Feces and air bubbles can be observed emerging from the opening. Inflammatory changes in the mucosa of the bladder are usually marked, varying from simple hyperemia to exuberant granulations, bullous edema, ulceration, necroses, and erosions. When the fistula is first established, there is usually an acute generalized cystitis. Later, there is a unique

absence of diffuse cystitis. This is accounted for by the absence of distinct lymph channels in the mucous membrane, by the presence of a protective non-absorbing transitional type of cell, and by the fact that the infective material is constantly being diluted and kept in motion by the ingress and egress of the flow. Catheterization of the fistulous tract must be done with care lest a false channel, or even an opening into the peritoneal cavity, be made.

Occasionally a cystogram will define the communication and locate its bounds. Of more value is roentgenological examination of the lower bowel, not only in visualization of the fistula, but also in determination of the nature of the vesical lesion. This particularly obtains in the diagnosis and differential diagnosis of diverticulitis and carcinoma.

If cystoscopic examination fails to locate accurately the fistulous opening, the administration of an enema of methylene blue during cystoscopic scrutiny may be of distinct advantage.

Sigmoidoscope examination is an aid in the determination of the vesical lesion, but too frequently the enteric opening of the fistula is obscured by mucosal folds and inflammatory edema of the adjacent mucous membrane. Vesical instillation of methylene blue during the sigmoidoscopy may facilitate visualization of the fistulous entrance. In those instances in which the small bowel enters into the vesical communication (approximately 9 per cent), a gastro-intestinal x-ray series is helpful.

There is no one set outline to follow, each case presenting its own peculiarities, but by the proper combination of some of the procedures mentioned previously, an accurate diagnosis can often be made.

TREATMENT

The treatment of vesico-intestinal fistula is variable, depending on the given circumstances in each case. It may be that medical therapy is indicated—palliative, symptomatic, or perhaps anti-luetic treatment in the case of syphilis. In other cases surgery, conservative or radical, may be the treatment of choice.

Non-operative measures have a restricted indication because (barring those patients who are moribund at the first examination) the great majority require surgical intervention, even if it is only palliative in nature. Surgical measures were employed in 45 per cent of the 471 cases considered in this report. This figure is minimized by the fact that in more than 15 per cent no active therapeutic measures were feasible because of the patient's poor condition. Medical therapy is directed toward making the patient comfortable and is of greatest advantage in inoperable carcinoma and tuberculosis; occasionally it serves as a therapeutic trial in early vesico-intestinal fistula secondary to a benign lesion. Medical treatment consists of a non-residue diet with restraint of bowel movements, followed in a few days by active drug therapy conducive to loose movements, combined with rectal irrigations. Bladder irrigations and urinary antiseptics are administered, and apprehension and pain are allayed by appropriate sedatives and opiates. By this treatment a fairly comfortable existence may be obtained for an extended period of time.

The surgical approach dates back to as early as 1843, when Barbier de Mille suggested colostomy; and Pennel, in 1850, and Curling, in 1852, performed that operation. In 1884, Le Dentu attempted transvesical closure of the fistula, but without success, and Boiffen, in 1891, effected a cure by a primary closure through an abdominal incision.

At the present time it is recognized that the type of surgery indicated depends principally on the character and extent of the primary lesion. Simple diversion of the fecal stream by colostomy and of the urinary stream by cystostomy is applicable as a palliative procedure in an extensive malignant or tuberculous process if a reasonable prolongation of life can be expected. Of course, this requires knowledge of the location of the intestinal fistula in order that the colostomy may be established above this site. In other cases suprapubic cystostomy alone may be used in palliation of an advanced malignant growth.

For cure of the congenital, traumatic, and inflammatory types of fistulas, several lines of choice are at hand. First come methods of drying up the fistula, after which many fistulas will close. Such methods include the use of a retention catheter or, if necessary, cystostomy and a non-residue diet, or sometimes colostomy to divert the urine and feces. Most tracts kept dry and empty will close spontaneously. Unfortunately, however, cystostomy and colostomy will not keep most tracts dry. The surgery of direct closure will depend on the conditions present. For low rectovesical fistula in men the Young-Stone operation is highly successful even without colostomy and is to be preferred, therefore, to the surgery for drying up the tracts and permitting spontaneous closure.

Abdominal incision with separation of the bladder and intestine and repair of the openings, or resection of a portion of the gut and bladder to include the fistulous tract has several indications. It is of most value in traumatic and inflammatory processes, especially in appendicovesical fistulas.

This procedure may also be used in certain cases of diverticulitis in which the intestinal involvement is at a minimum.

Other cases may lend themselves to the perineal or vaginal approach if the opening is low down. By this method it is usually not possible to close the rectal and vesical openings, but by separation of the two viscera, packing the wound, and packing the rectum above the fistulous opening satisfactory results may be obtained. This procedure must be combined with a non-residue diet and adequate tying of the bowels for a period of time sufficient to insure healing of the tract.

Regarding treatment of the most frequent offender, diverticulitis, one of several methods may be chosen. When an acute inflammatory process is involved it is almost imperative that a preliminary operation be done to divert the fecal stream. If the patient's condition is good and surgical intervention is in the immediate offing, a cecostomy is done. Usually, however, it is best to divert the fecal stream completely by means of a colostomy, and the primary leakage by cystostomy. These procedures alone frequently will cause the inflammatory mass to subside, and spontaneous closure of the fistula may occur. If the fistula does not close, an exploratory laparotomy is carried out. Examination may reveal only minimal involvement of the bowel, in which case it is possible to excise the fistula and close the vesical and intestinal openings. Usually, however, the preferred treatment is resection of the involved bowel with its fistulous tract, with end-to-end anastomosis of the colon. This procedure reduces the chance of recurrence and technically is of advantage because normal bowel is being used in the reconstruction.

In respect to operable carcinoma of the rectosigmoid with vesico-intestinal fistula, the surgical procedure indicated is very much the same as in uncomplicated carcinoma. No lengthy discussion is warranted here regarding the efficacy of resection of the growth with end-to-end anastomosis, or abdominoperineal resection with a permanent colostomy, or the numerous other types of operations for malignancies of the rectum and sigmoid colon. The only additional maneuver that may be involved, that is, in addition to the procedure required by the uncomplicated case of carcinoma, is a partial resection of the wall of the bladder where the latter is invaded.

From the foregoing discussion it can be seen that a correct diagnosis as to the primary lesion plays an important part in the type of surgical approach chosen. In this respect Beer of New York City emphasized the importance of obtaining a biopsy of the fistulous tract before operation, when possible, in order that the subsequent therapy can be determined.

PROGNOSIS

By the very nature of the type of lesion causing vesico-intestinal fistulas, the prognosis is generally grave, both as to life and the likelihood of repeated operations.

In the traumatic variety of vesico-intestinal fistula a favorable outlook can be maintained, as many close spontaneously and those that do not are usually amenable to surgery. In the inflammatory variety a somewhat less optimistic attitude should be assumed. Spontaneous cure is less common and the success of a surgical procedure is hampered by the fact that the bowel used for suturing is frequently friable and of poor material, and a narrowing of the bowel below the lesion is often present, and tends to increase the pressure on the suture lines. The outlook is poorest in those cases secondary to carcinoma or tuberculosis, for the disease is frequently in the inoperable stage when the diagnosis is first made.

There is such marked disagreement in the literature regarding the expected prognosis that no figures are quoted here other than the results of the 471 cases in which the final outcome could be determined.

In a table similar to that in the article by Parham and Hume, the following figures were compiled:

TABLE III.—RESULTS OF TREATMENT

	Surgical		Medical	
	No. of cases	Per cent	No. of cases	Per cent
Cured	88	19	51	10
Improved	38	8	19	4
Unimproved	18	4	20	4
Deaths	61	13	176	37

From the figures given in Table III, it can be seen that the outlook is anything but favorable in the face of a combined mortality of 50 per cent and a curability rate of less than 30 per cent. This is actually, however, what should be expected when one recalls that the most prominent etiological factors are those diseases least amenable to cure. The average life expectany of all types and stages of the disease is about three years.

There has been no remarkable change for the better in the treatment of vesico-intestinal fistula in the past twenty years and there seems no immediate promise of improvement.

SUMMARY

Since Praxagoras' description of a case of vesico-intestinal fistula in the second century, re-

TABLE IV.—SUMMARY OF THE 21 CASES OF VESICO-INTESTINAL FISTULA IN THE UNIVERSITY OF CALIFORNIA HOSPITAL

Hospital number	Sex	Age	Etiology	Fistula between bladder and	Treatment	Result
22902	M	68	Diverticulitis	Sigmoid	Excision of fistula with enteroplasty and cystoplasty	Dead 5 weeks later
57840	F	50	Carcinoma of sigmoid	Sigmoid	Mikulicz procedure—excision of tumor	Improved
40394	F	28	Following salpingo-oophorectomy for tuberculosis	Rectum and skin	Conservative—irrigations, etc.	Cured
77036	M	62	Traumatic catheterization*	Transverse colon	Transurethral resection for prostatic hyperplasia	Cured
55949	M	67	Radical perineal prostatectomy	Rectum	Cystostomy and Young-Stone recto-vesical repair	Cured
42479	F	62	Radium burn in treatment of cancer of bladder	Rectum	Continuation of cystostomy	Unimproved
79313	F	49	Following myomectomy	Descending colon	None	Unimproved
75411	M	54	Tuberculosis of lung and bowel	Rectum	None	Unimproved
35021	M	33	? Trauma	Rectum	None. Patient had physiological severance of cord at L_2	Unimproved
573	M	15	Traumatic catheterization*	Rectum	None	Unimproved
73146	M	28	Postoperative rectal fistula with subsequent abscess	Rectum and urethra	Cystostomy and perineal fistula repair	Unimproved
72293	M	54	? Trauma	Rectum	None. Patient was psychotic	Unimproved
7416	M	66	Radium following prostatectomy for cancer	Rectum	None	Dead
7486	M	63	Radium following partial cystectomy for cancer	Rectum and ileum	None	Dead
14269	M	63	Radium for cancer of bladder	Rectum	None	Dead
17876	M	56	Cancer of bladder	Rectum	Cystostomy and radium	Unimproved
19251	M	50	Cancer of bladder	Rectum	Conservative—medical	Unimproved
11790	M	38	? Tuberculosis. Urine culture positive	Rectum	None	Unimproved
91246	F	22	? Appendiceal abscess	Ileum	Resection with end-to-end anastomosis	Cured
88373	M	64	Following abdominal operation thirty-three years before	Rectum	Medical	Unimproved
83167	M	53	Cancer of rectum	Rectum	Colostomy	Unimproved

*Not done in this hospital.

ports of over 600 cases have appeared in the literature. The incidence is 3 in males to 1 in females and the average age of the patients is fifty-one years. Diverticulitis is the most frequent etiological agent, and, with the addition of tuberculosis and carcinoma, accounts for about 50 per cent of the cases.

The enterovesical communication is most common between the bladder and the rectum, is of the direct variety when secondary to carcinoma or tuberculosis, and of the indirect variety when secondary to an abscess associated with diverticulitis. The vesical opening is located most commonly in the region of the trigone, more often on the left side.

The cardinal symptoms are pneumaturia, fecaluria, and the passage of urine by rectum. These are associated with the symptoms of cystitis and those of the intrinsic lesion causing the fistula. The complications of seminal vesiculitis, epididymitis, fecal vesical calculus, and ascending pyelonephritis are relatively infrequent.

The diagnosis of vesico-intestinal fistula is facilitated by the appropriate use of cystoscopy, cystograms, sigmoidoscopy, barium enemas, and methylene blue by rectum.

Treatment may be palliative, either medical or surgical, or curative. To achieve a cure, primary closure with excision of the fistula may be the method of choice, or resection of the lesion of the bowel, with or without preliminary colostomy, may be used.

The prognosis, only fair at best, is most favorable in the traumatic variety of fistula, less

favorable in the inflammatory group, and least favorable in carcinoma or tuberculosis.

CONCLUSIONS

1. Vesico-intestinal fistulas occur with sufficient frequency to require, on the part of the practicing urologist, a thorough knowledge of the syndrome and diagnostic procedures indicated.

2. Treatment is fundamentally surgical, whether it be palliative in nature or curative.

3. The average life expectancy of all types is about three years.

4. The mortality is greatest in cases with fistulas caused by carcinoma or tuberculosis, somewhat less for those with fistulas caused by inflammatory processes, and least for those with traumatic fistulas.

5. No improvement in curability is demonstrable in the past two decades.

I wish to thank Dr. Frank Hinman, Clinical Professor of Urology, for his interest and help in writing this review.

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GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Surraco, L. A.: Pyelographic Diagnosis and Treatment of Polycystic Kidney (Diagnóstico pielográfico y terapéutica del riñón poliquístico). *Memoria Soc. uruguaya de urol.*, 1937–38, 3–4: 7.

Surraco states that the pyelographic study of polycystic disease of the kidney reveals the presence of common signs which establish the diagnosis in some cases and suggest it in others. Interpretation of the pyelogram requires an analysis of the aspect of the image as a whole and of the aspect and the relations of its different elements to the renal contour, to the renal pelvis, and to the primary and secondary calyces.

The aspect of the image as a whole shows the bilateralism of the changes in the pyelogram, the salient characteristics of which are total, regular, and harmonious enlargement with relative narrowing; these factors are variable in each case. The individual and collective aspect of the pyelograms of different patients presents a surprising complexity which defies the most astute comparisons. The pyelogram of each case shows an individual arrangement that recurs over its entire extent and in both kidneys.

In the simple roentgenogram, the renal contour is enlarged, especially in length, and keeps its regular form or presents an undulating aspect because of superficial cysts. Bilateralism of this condition constitutes a diagnostic sign of probability and even certainty of polycystic disease, while unilateralism has no diagnostic value by itself. Pyelography confirms the diagnosis. The pelvis shows itself generally to be small with early division into primary calyces, lengthened, narrowed, and with clearly marked contours. The calyces are long, narrowed at their isthmus, and shaped like an hourglass, with regular and clearly marked contours of the isthmus, and have an apex opening into multiple goblets with well delimited contours. The disposition of the primary calyces is important: generally, the upper and the lower ones form a straight line. The author attaches special diagnostic significance to the presence of multiplicity of the goblets of the apex and to the presence of his own three signs, which are: curvatures or crescents on the primary calyces and the goblets of the apex, encasements, and sprays (rosettes); the latter two may both recur in two or three superimposed series, in which case the sign of the spray makes the diagnosis certain. When most of these signs are found, as in the 18 cases which the author reports, the diagnosis is established; when only a few isolated signs are present, as in 4 of his cases, the diagnosis is doubtful and the possibility of neoplasm must be considered; unilateralism, segmental changes, the absence of a regular contour of the pelvis, and calyces and goblets of the apex which seem to be blurred or cloudy militate against polycystic disease.

The treatment of polycystic kidney is subordinated to the anatomical and clinical concept of the disease which is characterized by an anatomical syndrome (bilateralism) and a clinical syndrome (progressive renal insufficiency). The bilateralism is present in all cases and the progressive renal insufficiency is caused by the destruction of the parenchyma through the development of the cysts, and possibly by the toxic action of the contents of the cysts on the organism. The disease is usually discovered between the ages of twenty-five and forty years, and the patients finally die from uremia, especially the azotemic type. These facts make it evident that the treatment of choice must be medical and that recourse can be had to surgical intervention only in the case of extreme necessity in the presence of certain complications; even then the intervention must be conservative.

The complications which call for surgery are hypertension, pain, hematuria, infection, alterations by visceral compression, tuberculosis, lithiasis, and spontaneous rupture. Nephrectomy is urgently indicated in miliary suppuration and incoercible hemorrhage, and is used deliberately in exceptional complications after a comparative functional study of the two kidneys. Pyelotomy is employed in lithiasis; the difficulty of the intervention lies in the fact that the pelvis is small and difficult to expose, and this condition becomes even worse when the calculus is in one of the calyces. Nephrotomy is to be rejected because of its high mortality. Puncture of the cysts is done to relieve pain; its results are negative or doubtful. Decapsulation and excision of the cystic walls is the operation of choice for pain, hematuria, suppuration, and the symptoms of nephritis and hypertension; associated with fixation, it is the best intervention to relieve pain from any cause. Nephropexy, which the author has used with good results in 12 of his 22 cases, is easily executed by the use of the membranes obtained by decapsulation and extirpation of the external wall of the cysts.

RICHARD KEMEL, M.D.

BLADDER, URETHRA, AND PENIS

Schaer, W.: Experimental Researches on the Powers of Absorption and Excretion of the Mucous Membrane of the Bladder (Experimentelle Untersuchungen ueber das Resorptions- und Ausscheidungs-vermoegen der Blasenschleimhaut). *Ztschr. f. urol. Chir. u. Gynaek.*, 1938, 44: 183.

The conditions of absorption by the bladder are still by no means clearly understood, and of excretion by the bladder we know nothing whatsoever. Numerous publications dealing with the subject are briefly reviewed in this work, but in the opinion of

the author not one of them explains the conditions of absorption. Evidence has recently been brought out that absorption of numerous substances may occur without unusual prerequisite conditions.

In the experiments for investigating absorption, female dogs were used, for the most part, and exclusion of the bladder was obtained by the establishment of double ureteral fistulas. The bladder was then emptied by a thin catheter and was irrigated repeatedly to remove the last remains of urine. Various exactly measured quantities of a chosen solution were then instilled into the bladder. The concentration of this solution was quantitatively determined beforehand, and the instillate was left in the bladder for different lengths of time. After the fluid had been expelled, its ingredients were quantitatively determined, and in the case of each ingredient the amount absorbed was found by subtracting the quantity evacuated from the quantity known to have been present in the original solution.

ANIMAL EXPERIMENTS

Absorption of substances dissolved through ionic disperse action.

1. Sodium iodide. This is absorbed rapidly and in a large amount. The experiments show clearly that substances pass through the mucous membrane of the bladder not only from hypertonic solutions but also from isotonic and hypotonic solutions. The bladder affected by cystitis possesses a heightened power of absorption.

2. Strychnine in rabbits. The experiments showed permeability for this poison.

Absorption of substances dissolved through molecular disperse action.

1. Sugar. The greater the concentration and the greater the pressure, the larger was the amount of sugar absorbed.

2. Urea. The results corresponded to those of Frey and Fender. As compared with solutions obtained through ionic disperse action, the amount absorbed is less with urea and dextrose, i.e., the smaller the particles before absorption, the greater were the quantities of each that were absorbed.

Absorption of colloidal substances. Experiments with colloidal dye stuff solutions. Two cubic centimeters of methyl blue or of sulfphenolphthalein were introduced through the aboral ureteral stump into the bladder of a dog with a unilateral ureteral fistula. The urine dripping from the oral stump of the ureter was caught and saved. After from forty-five to seventy minutes, excretion of the dye was macroscopically evident.

Absorption of gas-forming substances. In this experiment ethyl chloride was introduced. Increasing drowsiness of the animals was first noticed after the bladder was well filled and distention had taken place. However, it was always possible to awaken the animals by mechanical stimulation. The expired air had a definite odor of ethyl chloride. In this connection the author points out the possibility of a vesical basal narcosis.

Absorption of corpuscular elements. Particles of India ink penetrated in large numbers into the deeper mucosal and muscular layers, the regional lymph glands, and the spleen. The liver remained free.

Resorption of urine. Urine was instilled into the bladder and left for twenty-four hours. It was determined not only that the animal's own urine was resorbed, but, further, that all the substances present in the urine were able to pass through the bladder wall. Resorption was most active in the case of urea.

Resorption of water. Water also can be resorbed and the amount resorbed depends on the degree of thirst of the animal.

Route of absorption by the vesical mucous membrane. To a considerable extent absorption takes place by way of the lymphatics, not only in the case of the corpuscular elements but also in that of substances in solution. Experiments showed that the addition of adrenaline did not retard absorption. This may be explained on the ground that adrenaline, which contracts the blood vessels, also dilates the lymph spaces.

EXPERIMENTS ON HUMAN BEINGS

The bladder was emptied with a catheter and then a known quantity of the solution to be tested was introduced into the bladder, and after a certain time, during which it became mixed with the freshly entering urine, it was evacuated and tested. The tests showed that: (a) sodium iodide was absorbable; (b) from 7 to 25 per cent of a 4 per cent solution of indigo carmine was absorbed; and (c) from 14 to 32.7 per cent of percaine was absorbed.

All these experiments showed that the ulcerated bladder is capable of absorbing as much as three times the amount that the normal bladder absorbs. It could be demonstrated that all the laws relating to absorption which are valid for animals are true also for man. Contrary to what appears in numerous reports in the literature, it was found that there is absorption not only of hypertonic, but also of hypotonic solutions, as already stated, and not only in the case of a diseased bladder, as was previously assumed, but also in the case of an entirely healthy bladder. Anesthetizing substances are absorbed with especial ease.

As to the capacity of the vesical mucous membrane for excretion, it was demonstrated that substances which otherwise are secreted by the kidney with the urine may pass into the bladder directly from the blood. Two experiments to test this possibility were made on human beings with complete anuria.

The capacity of the vesical mucous membrane for absorption and excretion of aromatic compounds was tested with beta-naphthylamin, which is known to possess strongly cancerogenic properties. The experiments were carried out in the Ciba laboratories.

Absorption experiments. The afore-mentioned substance was absorbed in various concentrations between 4.8 and 17.9 per cent. When solutions of higher concentration were instilled, the animals (rabbits) died with phenomena of poisoning.

Excretion experiments. In dogs, nephrectomized bilaterally, 10 c.cm. of a 2.9 per cent solution of beta-naphthylamin were injected subcutaneously at half-hour intervals. Tests of the saline solution used for irrigation of the bladder lining showed the presence of beta-naphthylamin after two hours of irrigation. The experiments allow the conclusion that the mucous membrane of the bladder is capable of absorbing beta-naphthylamin from the urine when it is present in very small amounts, as occurs in aniline workers. The substance is precipitated in the mucous membrane and deposited as small granules around the vessels. It is evident from these experiments that in the choice of substances to be used for irrigation of or instillation into the bladder the following points should be considered: toxicity, absorbability, concentration, bladder capacity, and condition of the mucous membrane.

(RINTELEN). FLORENCE A. CARPENTER.

GENITAL ORGANS

Geissendoerfer, R.: The Relation of Follicle Hormone to So-Called Prostatic Hypertrophy (Die Beziehungen des Follikelhormons zur sogenannten Prostatahypertrophie). *63 Tag. d. deutsch. Ges. f. Chir.*, Berlin, 1939.

There are essentially two conceptions of the influence of internal secretions in the development of prostatic hypertrophy. Both views concede a diminution of the testicular function in advanced age. As a result, the adherents of one view believe that there is an increased washing away of the hormone of the anterior pituitary lobe; others maintain that there is a preponderance of follicle hormone which is present also in the male organism. The latter condition is considered by Burrows, Kennaway, Lacassagne, Moszkowicz, and others to be the exciting cause of prostatic hypertrophy.

We report the results of our experiments with follicle hormone on mice and rats which for some time received various follicle hormones. The evaluation of these experiments was based upon macroscopic and microscopic study of serial sections of the urogenital organs. First, the normal organs of the experimental animals are described, particularly the various prostatic lobes. The following effects of the action of follicle hormones in experimental animals were demonstrated: retrogression of development in size and reduction of weight; involution of the testicles; tense distention of the seminal vesicles; with many hormone preparations 100 per cent enlargement of the dorsocranial prostatic lobes; and, sporadically, dilatation of the urinary bladder. Microscopically, quite typical changes were shown, chiefly the transformation of epithelium in the dorsocranial lobes into many-layered squamous epithelium; other changes consisted of cornification, formation of corpora amylacea, and plication, with simultaneous dilatation of the glandular tubes. Interstitial connective tissue was also increased; in general, therefore, phenomena of proliferation were found, while in the other prostatic lobes there was evidence of atrophy.

In a synoptic table, the results of the experiments are explained in greater detail. Particularly impressive was the effect of the follicle hormone when administered subcutaneously.

Since in sex hormones we are concerned with active principles which are specific as to sex but not as to species, it is important to make comparisons with the corresponding relations in man. As to prostatic hypertrophy, the following parallels are found:

Testicular involution in man appears spontaneously in advanced age, in the experimental animal as a result of the action of follicle hormone, in old men as a consequence of cessation of the testicular function, particularly of the internal secretion of the testicle, while the follicle hormone attains preponderance. In animal experimentation this occurs as a result of the artificial administration of a considerable amount of this hormone. In both cases, therefore, there is a disturbance of the hormone-quotient in favor of the feminine hormone.

Both in man and in the experimental animal only the dorsocranial prostatic glands are altered and enlarged; at the same time in both, the other prostatic glands (in man, the so-called surgical capsule) undergo atrophy. In both we find dilatation of the gland tubules of the dorsocranial glands, also epithelial transformation and formation of corpora amylacea. Although in man generally there is no transformation into squamous epithelium, nevertheless we find such appearances in the fetus and in the newborn at a time when they are subject to the action of folliculin. Thus a whole series of typical and analogous relations with reference to prostatic hypertrophy in man and the experimental animal may be ascertained.

On critical examination of all the theories so far advanced as to the cause of prostatic hypertrophy we must admit that the conception of its development as a result of a disturbance of the equilibrium of the hormone-quotient of the sex hormones not only is best substantiated physiologically and by pathologico-anatomical findings, but at the same time includes also all relevant factors.

(GEISSENDOERFER). J. M. SALMON, M.D.

Fischer, A. W.: Surgery of the Prostate (Zur Chirurgie der Prostata). *63 Tag. d. deutsch. Ges. f. Chir.*, Berlin, 1939.

As a thorough understanding of the symptoms presupposes an accurate knowledge of the pathologico-anatomical processes present in the prostate, the author presents the prevailing relationships of hyperplasia of adenomas by means of serial sections of the prostate at the different ages of life. The urethral walls are pressed together by the pressure of the adenoma, and the bladder musculature must first overcome this compression before evacuation of the bladder can occur. The hyperplasia of the adenoma must be considered today as of hormonal origin, as a result of the lack of male hormone. The

indication for surgery must depend on the function of the kidney during decompression with the catheter. Cases of heart and circulatory insufficiency, and with suppurative pyelonephritis and failure of kidney function, are primarily hopeless. In these cases a permanent fistula of the bladder helps but little, and medication is not of much avail. Immediately with the beginning of treatment with the residual catheter the ducts are severed. In his own material the author has shown that at the conclusion of the observation 70 per cent of the patients had become operable; 12 per cent symptom-free from the catheter treatment, although not cured; and 18 per cent were inoperable. One-half of the last died at the clinic, 90 per cent of the deaths being due to pyelonephritis and uremia. Ambulant cases are not discussed but there are among them cases of acute retention due to alcoholic overdistention with failure of the bladder musculature. In the literature the mistake of considering acute retention as an expression of a severe clinical picture is often made. The danger is the damage to the kidney. The kidneys are usually in good condition in acute retention but not in chronic disease with gradual increasing retention and back pressure.

The kidney function and relief of the toxemia are the deciding factors. At the present time after years of observation and comparison of clinical signs and chemical values, we can arrive at a much better evaluation of these factors and this is great practical progress. It has been shown that the kidney changes in so-called prostatic hypertrophy are to a great extent reversible, much more so than the internist will believe on the basis of his clinical material. One must not proceed schematically and consider cases inoperable just because the values for specific gravity are poor. Only the fact that the kidney still protects the individual from uremia is significant. If this can be made possible only at the expense of an increased amount of fluid with low concentration, it is sufficient and the patient is operable. Too many patients are considered inoperable. That only 15 per cent are operable, as some claim, cannot be true. That is proved by statistics which show a cure of five years' duration or longer following all operative procedures even in such supposedly inoperable cases. If the kidney is so insufficient that the patient is inoperable he will not live five years anyway.

Considerable attention should be paid to the possibilities of failure following these procedures. In practice the thorough and prolonged pre-operative preparation is of deciding significance. The delayed cases will fare better the longer the preparation, the better the local immunization of the bladder, and the higher the resistance of the patient. As opposed to the pre-operative preparation and decompression of the bladder and kidneys, the purely technical procedures are less important. To me personally the suprapubic route operation in several stages, and early getting out of bed on the part of the patient have been most gratifying. Others prefer the perineal route or the operation devised by Voelcker. In very heavy individuals it is, of course, easier to operate from the rear. It is impossible to give comparative statistics as the material is not chosen according to the same standards. Embolism also is a too uncertain phenomenon, varying too much in time and location to be of much significance in evaluation of a procedure. The procedure of Franck (bursting) gives good results, but it is much simpler also to peel out the adenoma after the bursting. The author employed the two-stage radical operation in 70 per cent of his cases with 8.6 per cent fatalities, half of which were due to emboli, the others being due to pyelonephritis which was diagnosed erroneously as being an operable condition. Electroresection is a usable procedure, but it cannot be considered an ambulatory procedure as so many laymen and some physicians seem to think. The danger of embolism may be less, but the danger to life as a result of infection is greater than with the radical operation. The method is not bad but it is not less dangerous than the radical operation and takes almost as long a stay in the hospital.

The theory that all operable cases should be operated upon radically and the inoperable cases should be treated by electrosurgery is not proper. Far too often cases are considered inoperable. If the case is not suited for one procedure it is not suited for the other. The patient whose kidney and circulation are insufficient simply cannot be saved. If a patient is operable one may give him his choice as to treatment but he should be informed that better permanent results follow the radical operation.

The field for electrosurgical resection is the early cases and the isolated enlargements of the middle lobe of the prostate. X-ray treatment may improve the early cases, but the results are irregular. The method may be tried in diabetics. Hormone treatment brought no results; it is possible that it induced a generalized stimulation of the body.

All therapeutic methods should be employed only in those cases which have been stabilized by proper pre-operative preparation. The residual urine must be constant. Rest in bed and treatment for cystitis alone are powerful healing measures. If one uses hormones and also treats the cystitis no definite evaluation of the hormone treatment can be made. The bars which occur at the entrance of the bladder are suitable for electrosurgery, also the cases of cancer of the prostate, in which all chance of doing a radical operation is past. In these cases electrosurgery may act palliatively.

(A. W. Fischer). Leo A. Juhnke, M.D.

MISCELLANEOUS

Bravetta, G.: Pneumopyelography in the Diagnosis of Urinary Calculi (La pneumopielographia nella calcolosi urinaria). *Arch. ital. di urol.*, 1939, 16:188.

With the development of roentgenography urological diagnosis has made enormous progress, especially in cases of renal calculus. Although simple roentgenography is helpful, it does not furnish pre-

cise enough information for a pyelotomy, nephrotomy, ureterotomy, or nephrectomy. Additional aids have been intravenous pyelography and retrograde pyelography after ureteral catheterization. These methods are successful in the majority of cases.

However, there are radiotransparent calculi which are not satisfactorily demonstrated by these methods. Busi has arranged a list of calculi according to the increasing opacity of their chemical constituents: acid-ammonium urate, uric acid, acid-magnesium urate, acid-sodium urate, acid-calcium urate, ammonium-magnesium phosphate, calcium oxalate, and calcium carbonate. Also pure cystine and xanthine stones are radiotransparent. Stones of this type may be rendered visible by the injection of a gas about them. The idea is an old one and was tried by Burckard and Poland in 1907. Since then it has been developed by a number of investigators; the author describes the literature in detail. Mention is made of the possibility of gas embolus if air is used or if the intrapelvic pressure is greater than 200 mm. of mercury. The method is useful in the more accurate localization of calculi and their differentiation from fecaliths, biliary calculi, calcifications in the lumbar region, and calcified mesenteric and retroperitoneal glands.

The author uses oxygen in his technique because it is more readily absorbed and there is little danger of gas embolism. Contraindications are (1) uremia, serious and acute; (2) fever; and (3) hematuria. No anesthetic is given because the patient's subjective sensations of fullness of the renal pelvis are used to determine when to stop the injection of oxygen. Usually from 7 to 15 c.cm. are injected through the ureteral catheter by means of a sterile 20-c.cm. glass syringe.

The author describes briefly 5 clinical cases with accompanying roentgenographic illustrations. All of these cases were treated surgically and the roentgenographic diagnosis was confirmed.

In one of the author's cases a ureteral calculus was demonstrated. Simple x-rays showed a shadow

Fig. 1.

which could not be definitely interpreted as urinary in location. Intravenous pyelography demonstrated the pelvis, calyces, and ureter clearly, but obscured the stone. Retrograde pyelography with an opaque medium presented the same difficulties. However, an injection of oxygen definitely demonstrated the calculus within the ureter (Fig. 1).

Pneumopyelography in certain instances may give brilliant results. No final judgment should be passed in doubtful cases by any specialist as to the presence of a urinary calculus until this precise method of diagnosis has been used.

The author presents a brief bibliography of the pertinent literature. JACOB E. KLEIN, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Baehl, E.: Osteitis Tuberculosa Multiplex Cystoides in Youth, with Especial Attention to the Positive Tuberculin Reaction and the Blood Picture (Beitrag zur Juenglingschen Ostitis tuberculosa multiplex cystoides mit besonderer Beruecksichtigung der positiven Tuberkulinanergie und des Blutbildes). *Deutsche Ztschr. f. Chir.*, 1938, 251: 349.

This disease of bones during youth is recognized from the small cyst formations. In the majority of cases these develop symmetrically in the proximal and middle phalanges of the fingers and toes. A single case is recorded in an eighty-five-year-old man. This disease which exhibits a self-evident secondary form of tuberculosis occurs most often in the third and fourth decade of life.

There is a recognized relationship between this bone disease and two skin diseases, namely, lupus pernio and Boeclis sarcoid, which the author states may be identical. In the described case there was found on the terminal phalanx of the index finger a bluish-red swelling painful on pressure which corresponded to the nodular localized form of Boeclis miliary lupoid. Microscopically there were found epitheloid cells, lymphocytes, and giant cells. Twelve years earlier the patient had suffered from a disease of the lung associated with fever which had been diagnosed as pneumonia. However, from a study of the lung markings on the roentgen film, it may be concluded that the disease in question was tuberculosis of the lung. The tuberculin reaction in this case was positive and there was a distinct eosinophilia. The lowering of the tuberculin sensitivity and the simultaneous eosinophilia is not a mere accidental coincidence.

(Brunner). Hawthorne C. Wallace, M.D.

Girardi, V. C.: Specific Local Serotherapy in Gonococcic Arthritis (La seroterapia especifica local en las artritis gonocóccicas). *Rev. de ortop. y cirug.*, 1939, 8: 300.

Since 1933 Rizzo and Pierini have been using in Argentina specific local serotherapy in the treatment of gonococcic arthritis. The good results obtained by them encouraged Girardi to employ this method in 1934, with the following technique:

Articular puncture and aspiration of the largest possible quantity of the intra-articular contents, with immediate injection, into the joint, of a quantity of anti-gonococcic serum amounting to a little less than the extracted fluid.

From 20 to 30 c.cm. of serum are also injected in the periarticular tissues, sometimes with ½ per cent novocaine. The intra-articular and extra-articular pathways are combined so that the largest possible amount of serum is injected locally.

There may be a local and a general reaction: a slight rise of the temperature, general depression, and immediate increase of the pain. The injections are repeated every twenty-four or forty-eight hours. From 5 to 7 injections are necessary.

The first symptom to respond to the injection is the pain. This slowly disappears after a short period of aggravation. After 3 or 4 injections, there is also a noticeable diminution of the swelling.

The joint can be mobilized after a few days of treatment; then, physiotherapy, local heat, massage, and mobilization can be started.

Nine cases of gonococcic arthritis are reported. The ages of the patients were between eighteen and forty-six years. Three patients were women and 6 men. In 5 cases the knee was involved, in 3 the ankle, and in 1 the wrist.

The bacteriological examination of the articular exudate was positive in 4 cases. The number of local injections was: 3 in 1 case, 4 in 3 cases, 5 in 4 cases, and 6 in only 1 case.

All of the patients showed spontaneous diminution of the pain after 1 or 2 injections.

All the cases presented hydrarthrotic forms of the condition, which benefit more than any other from the local serotherapy.

This method can be used also in the early treatment of the phlegmonous form, when arthrotomy can be avoided.

The author did not notice any complications. Slight serological reactions disappeared with simple therapeutic measures. It is suggested, however, that the patients be desensitized previously to the injection.

The treatment must be carried out as early as possible. Hector Marino, M.D.

De Santo, D. A., and Wilson, P. D.: Xanthomatous Tumors of the Joints. *J. Bone & Joint Surg.*, 1939, 21: 531.

Nine new cases of xanthomatous tumors of the joints are presented in detail with accompanying roentgenograms, photographs, and photomicrographs. There are 32 previously reported cases in the literature. The authors believe that xanthomatous tumors of the joints are more common than the number of reported cases would indicate, and that they are frequently treated for long periods under the diagnosis of villous arthritis, chronic rheumatoid arthritis, loose body, joint mouse, or torn cartilage. It is even possible for the true nature of the lesion to be overlooked at operation.

There are three types of xanthomatous tumors of the joints: solitary, multiple, and diffuse. The solitary tumors are the most numerous; they are almost invariably pedunculated and attached to the synovial membrane; they are rounded or spheroidal, golden yellow or orange, and are studded

with purplish-red or black areas representing hemorrhages of varying antiquity. The multiple tumors involve isolated areas of synovial membrane and vary in size and shape. The underlying area of involved synovial membrane has the same orange-yellow coloration as the tumors. In the diffuse variety the entire synovial membrane shows yellowish discoloration and is studded with innumerable small and large papillary, polypoid, and pedunculated nodules. The intervening synovial membrane resembles that of a hemorrhagic arthritis; it is arranged in exaggerated fern-like folds. Xanthomas are found to originate in chronic hemorrhagic villous arthritis.

The pre-operative diagnosis of xanthoma of the joints seems never to have been made. Obscure intermittent swelling of the knee joint (36 of the 41 reported cases were in the knee joint) associated with pain, free fluid, occasional locking, and the presence of a movable tumor usually medial to the patella, will frequently be found to be caused by a xanthoma. Aspiration of the joint with the recovery of dark or sanguineous fluid points to the presence of a xanthoma. The demonstration of a large amount of cholesterol in the fluid is probably pathognomonic of xanthoma. The blood cholesterol is frequently elevated. Roentgenographic examination is of value in a negative way because it rules out the presence of a joint mouse, and although it will frequently not demonstrate the tumor, it occasionally will reveal the shadow of a soft-tissue tumor.

Joint xanthomas can be cured by radical excision. Local excision is sufficient for solitary tumors, but in the case of multiple or diffuse xanthomas a subtotal or total synovectomy is usually necessary. Recurrence of the tumor occurred in 7 of the 41 reported cases. Recurrences are probably due to the later development of a small tumor undiscovered at the time of operation or to inadequate removal of the primary tumor. No instance of a benign giant-cell xanthoma undergoing malignant transformation has ever been reported. The only difference between a xanthoma and a giant-cell tumor of the synovial membrane is the presence of the "xanthoma cell," "foam cell" or "lipoid cell" in the xanthomas.

The relationship between joint xanthomas and other forms of systemic xanthomatosis may be expressed as follows: while many cases of joint xanthomas are associated with hypercholesterolemia, no coincidence of joint xanthoma with systemic forms of xanthomatosis exists. Joint xanthomas are related to some fundamental disturbance of the lipoid metabolism and possess the "foam cell" in common with various forms of systemic xanthomatosis. The stroma cell is related to the reticulo-endothelial system. It is derived from the surface synovial-membrane mesothelium, which has reticulo-endothelial properties and gives rise to the "foam cell," the giant cell, and the pigmented cells found in xanthomatous tumors.

ROBERT P. MONTGOMERY, M.D.

Horwitz, M. T.: Lesions of the Supraspinatus Tendon and Associated Structures: Investigation of Comparable Lesions in the Hip Joint. *Arch. Surg.*, 1939, 38: 990.

Abduction of the arm is accomplished by a complex mechanism, which is studied from the standpoint of the individual muscular components involved. The importance of the action of the supraspinatus muscle in furnishing a fulcrum for the humeral head in the glenoid cavity for the action of the deltoid muscle has been stressed by Codman.

The shoulder joints (150) of 75 cadavers were studied for changes about the shoulder joint. In 30 specimens variable changes in the bursæ were noted. There were 10 complete tears of the supraspinatus tendon. In 49 specimens the upper portion of the musculocutaneous cuff showed variable amounts of thinning, measuring in some instances from only 1 to 2 mm. In 30 cases the superficial surface of the supraspinatus tendon was frayed with separation of the tendon fibers to cause bands or straps. In these cases involvement of the subscapularis was almost as advanced. In 105 specimens there were marked changes in the biceps tendon and bicipital grove with 4 complete tears of the tendon. There were bony changes in all cases, which seemed proportional to the amount of change in the soft tissues.

Since these lesions were demonstrated in the dissecting laboratory on cadavers, with histories which contained no hint of injury, the author is inclined to take issue with many of Codman's conclusions. Horwitz believes that there is a gradual deterioration of the supraspinatus tendon from excessive use and advancing age, and that these changes pave the way for its rupture. Furthermore, the studies quoted above show that the changes are not confined to the supraspinatus tendon, but are common

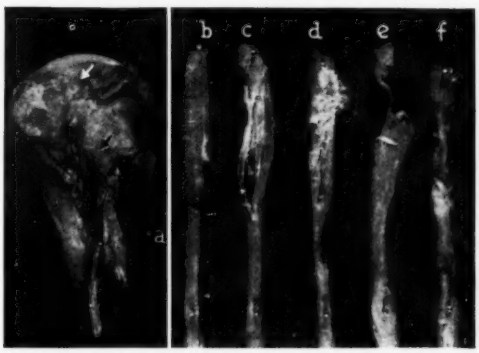

Fig. 1. At *a* is shown the long bicipital tendon completely severed, the proximal segment having reattached itself to the articular surface and the distal segment to the lesser tubercle. Note the recession of the greater tubercle, marginal proliferation and obliteration of the bicipital groove. The tendons lettered from b to f are long bicipital tendons showing varying stages of flattening, fibrillation, fraying, and tearing.

to the musculocutaneous cuff and even to the bone. He believes that rupture of a sound supraspinatus tendon is rare, and questions the wisdom of subjecting tissues to surgical procedure, when they are the site of degenerative lesions incidental to advancing age, defective circulation, and attritional changes. HAWTHORNE C. WALLACE, M.D.

Hopkins, F. S., and Huston, L. L.: Knee Injuries in Athletics: A Study of End-Results. *New England J. Med.*, 1939, 221: 95.

An analysis was made of 193 cases of knee injuries in athletics in which the end-results are known. This group of cases covered a period of thirteen years and is particularly interesting because of the fact that every person included in this report trained to be a physical director and therefore has continued to do strenuous exercise since leaving college.

Football was responsible for 90 (47 per cent) of the knee injuries. Soccer, basket ball, gymnasium activities, track, wrestling, baseball, lacrosse, and various other sports were responsible to a lesser degree for the remaining cases.

The minor cases of cartilage injury were treated by the use of crutches, Ace bandage, and physical therapy. The more severe cartilage injuries were immobilized in a plaster cast, while in those cases which did not respond to conservative treatment, the cartilage was excised.

There were 19 patients with uncomplicated traumatic synovitis with effusion. Ten of the 19 were on crutches for an average of six and one-half days. The time lost from physical practice averaged thirteen days. The time required for complete recovery averaged four weeks. This analysis suggests that approximately 90 per cent of the results following simple synovitis with effusion are very satisfactory.

Of 59 cases of sprain of the lateral ligament, 54 presented involvement of the internal lateral ligament and 5 of the external lateral ligament. Treatment was given by means of physical therapy, Ace bandage, and crutches. Thirty-two patients were on crutches for an average of eight days. The time lost from physical practice averaged three weeks, and the time required for complete recovery averaged twenty-seven weeks. Eighty-two per cent of these cases showed a good end-result.

There were 40 patients with injury of a semilunar cartilage, treated without immobilization: in 37 the medial meniscus was involved, and in 3 the lateral meniscus. They were all treated without immobilization; the treatment was essentially rest, support, and physical therapy. Thirty patients used crutches for an average of fifteen days. The time lost from physical practice averaged five weeks. The time needed for complete recovery averaged seven months. Nineteen patients continued to have symptoms and were rated as not completely cured. In 13 patients, originally treated as belonging to this group, the cartilage was later excised, and 3 were found to have crucial ligament tears.

There were 22 patients with questionable injury of the semilunar cartilage. Treatment consisted particularly of rest, support, and physical therapy. Sixteen were on crutches for an average of twelve days. The time lost from physical practice averaged five weeks. Thirteen patients required an average of six months to recover completely from the injury. Seventy-eight per cent of the patients in this group had a good end-result.

There were 24 patients with injury of the semilunar cartilage who were treated by immobilization. The medial cartilage was involved in 21 and the lateral cartilage in 3. Nine of them showed a marked effusion. A cast was worn for an average of four weeks. Crutches were used for an average of four weeks. The time lost from physical practice averaged eight weeks. Forty-six patients in this group showed a good end-result. Fifteen patients averaged five months for complete recovery.

The end-results in all probable injuries of the semilunar cartilages (110) which were treated conservatively were good in 45 per cent of the cases.

There were 29 cases of injury of the semilunar cartilage which were treated by operation, and the interval from the first injury to the operation averaged nineteen months. In 25 of the cases the operative findings were known. Of these, 15 showed a fracture of the semilunar cartilage. Synovial fringes, fat tabs, or synovial villi were present in 13 cases. The crucial ligaments were torn in 4 cases. In 8 cases both cartilages were removed at the same operation. In 65 per cent a good result was obtained. The time from operation to walking without assistance averaged four weeks. The loss of time from physical practice averaged five months.

Eighty-nine per cent of the cases of simple synovitis and 81 per cent of the cases of sprain of a lateral ligament showed good final results. Forty-six per cent of the good results were obtained by immobilization of the injured semilunar cartilage. Thirty-six per cent of the good results followed treatment by means of bandaging, rest, crutches, and physical therapy. Sixty-six per cent of the cases with disabling symptoms showed a good end-result. RICHARD J. BENNETT, JR., M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Haggart, G. E., and Toumey, J. W.: Knee-Joint Arthrotomy for Removal of a Semilunar Cartilage: Technique of the Lateral and Anterior Incisions. *Surg. Clin. North Am.*, 1939, 19: 709.

The authors limit this description to operations for removal of the internal semilunar cartilage, but the same types of incisions on the external aspect of the knee can be used for removal of the external meniscus.

Two types of incisions are described, for although the anterior incision is the more commonly employed route, clinical history and subsequent examination may indicate injury to the posterior part

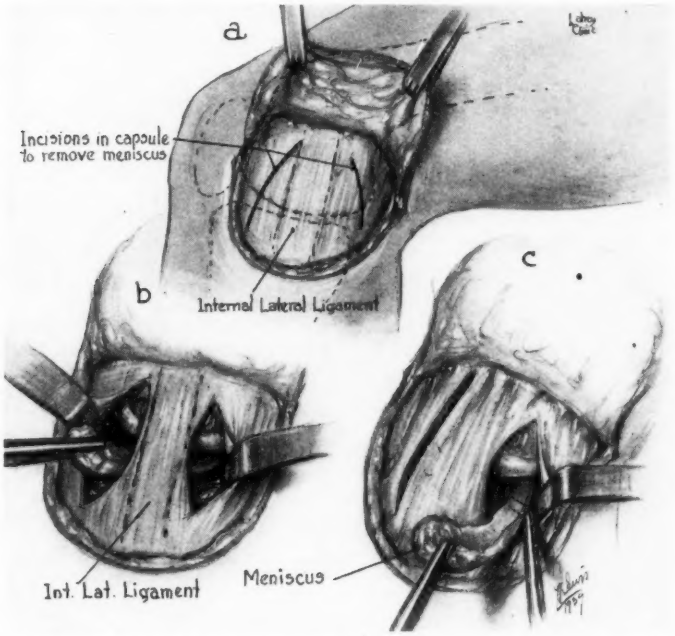

Fig. 1. The lateral incision (Timbrell Fisher). The internal lateral ligament is preserved, while the entire semilunar cartilage is removed.

of the cartilage, in which event the incision on the medial lateral aspect of the knee facilitates removal of the entire meniscus.

With the patient anesthetized, an Esmarch bandage is snugly wrapped around the 70-degree-elevated extremity, from toes to thigh and the tourniquet is then applied. This plan has been found to prevent postoperative nerve or circulatory complications, and the operative field is absolutely dry.

A vertical anteromedial incision, about 4 in. in length, is placed approximately midway between the medial border of the patella and the mediolateral ligament. The skin and subcutaneous tissue, and the capsule are divided as separate layers. The synovial membrane is grasped with forceps and incised, and the incision is lengthened with scissors. After the fat pad is retracted forward, the anterior attachment of the meniscus is easily seen and can be divided and grasped with a heavy clamp. The anterior portion of the meniscus is then freed from the synovial membrane. A special knife, that may be bent to conform to the contour of the femoral condyle, is used to free the posterior part of the meniscus. A small metal sucker, insulated with rubber except at the very tip, is used to remove excess fluid and to apply a coagulating current to otherwise inaccessible points within the joint.

With the exposure this incision affords, most of the cartilaginous surfaces within the joint and the external meniscus may be inspected. The wound is then closed in layers with interrupted sutures. Fine chromic catgut is used for the synovia, silk for the capsule, plain catgut for the subcutaneous tissue, and silk for the skin. A pressure dressing is applied and the tourniquet is removed. No splints are used and active and passive movements are started within a period of forty-eight hours following the operation.

The mediolateral incision is particularly helpful when it is considered essential to remove the entire cartilage because of damage to the posterior portion of the meniscus, but exploration of the joint, particularly of the anterior compartment, is rather limited.

The skin and subcutaneous fascia are reflected as one flap and lifted proximally; this exposes the capsule (Fig. 1, a). The knee joint is exposed through two incisions as shown in the illustration. The internolateral ligament is preserved, the medio-anterior and posterior compartments may be completely explored, and the entire semilunar cartilage can be easily removed. Closure and postoperative treatment are the same as described.

HOMER C. PHEASANT, M.D.

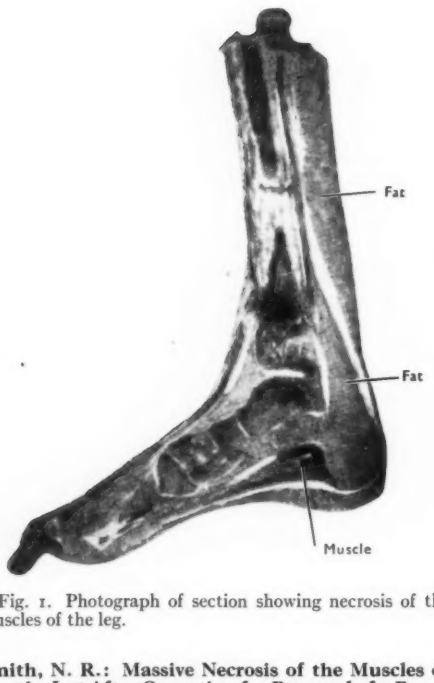

Fig. 1. Photograph of section showing necrosis of the muscles of the leg.

Smith, N. R.: Massive Necrosis of the Muscles of the Leg After Operation for Removal of a Bone-Graft From the Tibia. *Brit. J. Surg.*, 1939, 26: 780.

The author presents a case report in which there occurred massive necrosis of all the muscles in the leg, except for a small amount of muscle on the sole of the foot, following an operation for removal of a bone-graft from the tibia. There was no cutaneous gangrene excluding that at the margins of the wound and no local infective inflammation; neither was there any general disturbance in the health of the patient. The cause for the necrosis is not known and the case is presented as a warning of a possible result when a tibial graft is removed with the knee held acutely flexed. The author is not aware of any similar case being reported.

The case is presented in detail, with a pathological report of the amputated leg and a discussion of the possible causes of the necrosis.

ROBERT P. MONTGOMERY, M.D.

FRACTURES AND DISLOCATIONS

Gruca, A.: Intra-Articular Fractures (Intraartikulaere Frakturen). *Chir. narz. ruchu*, 1938, 11: 295.

Intra-articular fractures have their special mechanism, also different biological healing conditions, different prognoses, and different results from shaft fractures. The direct and indirect mechanism of fractures of the shaft is well known. In intra-articular fractures the anatomical structure of the epiphyses and joint ends plays an important rôle. It is different in adults from that in the aged, and in young individuals. Intra-articular fractures may be classified as follows:

1. Fracture by compression. The shaft is forced longitudinally on to the epiphysis. A transverse fracture occurs first and later the joint end is driven apart.
2. Fracture by shearing off. The line of force in the shaft does not go directly to the axis, but somewhat on a slant (condyle fracture of the femur).
3. Fracture by flexion with simultaneous rapid muscular contraction (transverse fracture of the patella or olecranon).
4. Fracture resulting from the tearing off of a piece of bone by a muscle (tearing off of the tuberosity of the tibia or of the tuberculum majus of the humerus).
5. Fracture caused by torsion.

The joint cartilage is either compressed or torn off of its bed and suffers nutritional disturbances even to necrosis. Fractures or fissures of the cartilage do not heal even after years. Necroses of the cartilage cause joint mice and interfere with function. Nutritional disturbances of the cartilage are clinically less distinct. The joint capsule in intra-articular fractures frequently is torn, its attachment to the bone is loosened, torn or compressed, or its nourishment is interrupted. Intra-articular hemorrhage, thickening of the bone at the site of attachment, and capsular thickening, all of which interfere with function of the joint, may occur. The ligamentous apparatus in general has good resistance. The sites of insertion are much less resistant. Tears of the ligaments play an important rôle in the reposition of the fragments. As the ligaments contain the innervation one sees considerable shock at the moment of injury, and, later, vasomotor disturbances of the joint (long-lasting effusions, periarticular edema, or bone atrophy, and, finally, changes in the synovial fluid). The accident itself does not influence the synovial fluid either in its chemical, cytological, or biochemical composition. The callus formation according to Bier is influenced unfavorably by synovial exudation. The epiphyseal cartilage is either compressed or torn off. If the reduction is good the cartilage does not lose its ability to produce bone. Interference with growth is rare. If reduction is not effected properly according to anatomicophysiological rules then irregular bone deposits will occur.

The periosteum must be considered in intra-articular fractures from three viewpoints: biological, mechanical, and as a positive or negative healing factor. If a joint fragment is torn from the shaft then the periosteum is frequently the only source of nourishment for that fragment. According to Moore the partially retained periosteum is an important factor for the maintenance of the reposition. The interposition of periosteal flaps between the fragments may prevent the reposition as well

as the healing. For a better understanding of the abnormal healing conditions of intra-articular fractures we should consult the work of Roux, Martin, Mueller, Walter, and Willich.

The author differentiates five types of intra-articular fractures: (1) fissures, (2) tearing-off of condyles, (3) monocondylar fractures, (4) bicondylar fractures, and (5) epiphyseal lysis, partial or complete. The complications are: early or late nerve injuries and trophoneurotic injuries, such as osteoporosis, hard traumatic edema, and ischemic contractures, as well as muscle atrophy. In the treatment of intra-articular fractures two important points must be considered: (1) ideal reposition, and (2) operative treatment. Incomplete reposition, which makes but little difference in shaft fractures, can lead to serious disturbance of function. As such reposition is not always possible with conservative treatment, operation must be done frequently. The line of incision should follow the line of fracture, and the fixation of the fragments should be done through the skin.

(Gruca). Leo A. Juhnke, M.D.

Kreuter, E.: Results Obtained with the Nicola Operation in the Common Dislocation of the Shoulder (Ergebnisse der Nicolaschen Operation bei der gewohnheitsmaessigen Schulterverrenkung). *Beitr. z. klin. Chir.*, 1939, 169: 32.

Puerckhauer, in 1919, was the first to utilize the biceps tendon and lead it through the head of the humerus in operations for habitual dislocation of the shoulder. Independently of Kreuter, Heymanowitch and Nicola employed the same procedure later. Nicola, whose name has been given to the operation, reported 42 of his own cases operated upon in this manner with only 3 recurrences.

The author makes his approach by splitting the deltoid muscle longitudinally a few centimeters from its anterior border. After inward rotation of the arm the exposed tendon of the long head of the biceps muscle is pulled out of the wound by a double hook. The capsule of the joint is split longitudinally. A hole is drilled through the humeral head parallel with the sulcus intertubercularis. The biceps tendon is divided as far distally as possible. The proximal end is threaded through the head and resutured. The joint capsule openings are then closed. The arm is placed in a splint for fourteen days, after which careful movements are instituted. The patient is usually discharged in a period of about four weeks.

The author had 3 recurrences in 16 cases operated upon by this method. Several of the patients returned to strenuous labor and some even became expert in athletics.

(Kreuter). Leo A. Juhnke, M.D.

Rush, L. V., and Rush, H. L.: A Technique for Longitudinal Pin Fixation of Certain Fractures of the Ulna and of the Femur. *J. Bone & Joint Surg.*, 1939, 21: 619.

The authors describe an ingenious method of internal fixation which is recommended for certain comminuted fractures of the upper end of the ulna and also for displaced fractures of the femur in the upper third, and in subtrochanteric regions, as well as for certain intertrochanteric fractures. A modified Steinman pin is used. In the ulna the pin is introduced axially into the olecranon, and is directed across the fracture site into the marrow cavity of the distal fragment. No immobilization is employed. In the femur, the authors introduce the pin through the greater trochanter, in the axial direction, into the medullary canal of the shaft. Loose fragments are held by wire.

Daniel H. Levinthal, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Edwards, E. A.: Chronic Organic Arterial Disease. *New England J. Med.*, 1939, 221: 251.

When the arterial supply to a limb is diminished, certain symptoms and disability follow. These vary more with the rapidity and degree of the diminution of the blood flow than with the nature of the disease responsible for the obstruction. Since these effects are so profound, it is of consequence to focus considerable attention on the resultant syndrome of arterial insufficiency, as well as on the specific "background disease."

The author presents a summary of present-day concepts of arterial insufficiency and of the most common background diseases. Localized or acute disorders, such as aneurysm, embolism, or trauma to arteries, and functional disorders, such as Raynaud's disease, are not considered in his discussion. Most of the cases of chronic organic occlusion of the peripheral arteries is caused either by arteriosclerosis or by thrombo-angiitis obliterans. The former is a metabolic disorder occurring in men and women of middle age. In diabetes the disease may occur in relatively young patients. Thrombo-angiitis obliterans, or Buerger's disease, occurs almost without exception in young men in the latter part of the second, or in the third or fourth decade. The patients are usually heavy tobacco smokers. The disorder is inflammatory and involves both veins and arteries. Involvement of the superficial veins in a "migrating phlebitis" may call early attention to the disease.

Fig. 1. Moenckeberg's sclerosis in an anterior tibial artery. The media is transformed into a calcified tube, which has fractured on sectioning. The lumen is unobstructed. The veins and nerve trunks are normal.

Obstruction of the major arteries by any disease diverts the arterial flow through smaller collateral channels. This results in a diminished blood flow, or arterial insufficiency, with symptoms which are independent of the "background disease" producing the obstruction. The symptoms and signs of arterial insufficiency may be conveniently considered under the following headings: (1) weak muscle action and intermittent claudication; (2) abnormally cold limbs; (3) hypesthesia, hyperesthesia, and spontaneous pain from ischemic neuritis; (4) diminished resistance to injury, and ulceration from trivial trauma; (5) blanching of the toes and feet on elevation, and rubor on dependency; and (6) faint or absent pulsation in the affected arteries.

The specific treatment of arteriosclerosis consists of the avoidance of mental and physical stress, the cessation or diminution of tobacco smoking, and moderation in the intake of cholesterol-rich foods. In Buerger's disease it is essential that the patient use no tobacco whatsoever.

The treatment of arterial insufficiency may be divided into the general care of the feet, the avoidance of tobacco, and the increase of the collateral blood flow. In the writer's experience, this increase of the collateral blood flow is best accomplished by the use of alternating suction and pressure. Such treatment is contraindicated in the presence of infection or thrombosis. Under these conditions, or when the apparatus is not available, Buerger's exercises should be used.

Attention should be paid to the general management of these patients. Optimum general health should be maintained, and the patient should be encouraged in his fight against pain and disability. In the acute stages of pre-gangrene, ulceration, or gangrene, the patient should be in bed in a hospital. The procedures previously described are used, with the addition of certain measures to diminish pain and to prevent infection. HERBERT F. THURSTON, M.D.

BLOOD; TRANSFUSION

Forssell, J.: Morphological Changes in the Bone Marrow and Blood in Acute Hemorrhagic Anemia (Morphologische Veraenderungen im Knochenmark und Blut bei akuten Blutungsanaemie). *Acta med. Scand.*, 1939, Supp. 101.

Forssell has made use of many of the newer hematological techniques in this extensive study of acute hemorrhagic anemia. In normal individuals, the bone marrow obtained by sternal puncture contained about four times as many reticulocytes per cent as the peripheral blood. There was also a greater proportion of young reticulocytes in the bone marrow than in the peripheral blood. Shortly after an acute hemorrhage, an increase in the reticulocytes (especially the early forms) appeared

in the bone marrow and blood. Very large hemorrhages seemed to produce anisocytosis and a decrease in the diameter of the red cells, but no appreciable change in the volume. With severe anemia, a decrease in the color and saturation index may occur. In a few cases, the ratio of erythroblasts and erthyroblasts in mitosis to leucocytes in the bone marrow was increased. There was at times a temporary increase and a shift to the left of the granulocytes of the bone marrow and blood.

During the first or second week after acute hemorrhage, the majority of the cases did not show good regeneration of erythrocytes. The peak of the reticulocyte rise usually occurred on the fifth to the eighth day after hemorrhage ceased. Following this spontaneous regeneration, the mean diameter of the red cells and the saturation index were low in most of the cases. In several patients, the color and volume indexes were normal. The erythroblast-myeloid ratio in the bone marrow was increased in almost all of the cases.

In some cases of hemorrhage after spontaneous regeneration had subsided, injections of liver extract caused a slight increase in the reticulocytes and erythrocytes. At the end of the period of observation, the patients showed lowered values in the mean red-cell diameter and in the color, volume, and saturation indexes. It was felt that the liver tended to reduce the degree of anisocytosis. Liver injections did not cause stimulation of the erythroblasts in the bone marrow.

Arsenic medication in acute hemorrhage following spontaneous regeneration caused a slight rise in the reticulocytes but did not affect the erythrocyte count. Arsenic had no effect on the size and hemoglobin content of the erythrocytes; it did, however, seem to increase the degree of anisocytosis. Erythroblastic hyperplasia was noted in the bone marrow in these cases.

Iron medication in posthemorrhagic anemia distinctly hastened the rate of blood regeneration. This was revealed by the marked increase in reticulocytes in the bone marrow and peripheral blood. During iron medication, there was an increase in the mean red-cell diameter and in the color, volume, and saturation indexes. The bone marrow showed an erythroblastic hyperplasia and a considerable number of erythroblasts in mitosis.

The changes that occur in the bone marrow and blood following iron therapy for hemorrhagic anemia seem to resemble somewhat the findings in pernicious anemia. The occurrence of nucleated red cells in the blood in acute hemorrhagic anemia is closer related to the degree of anemia and extent of blood loss than to the intensity of blood regeneration.

HOWARD L. ALT, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Woltman, H. W.: Postoperative Neurological Complications. *Surg. Clin. North Am.*, 1939, 19: 955.

The author remarks that perhaps the simplest and most readily understood of complications results from the injury of nerves. It is not beside the point to call attention to a few things, so obvious that they may be overlooked, namely, that the limbs of the relaxed and unco-operative patient provide secure and convenient handles for pulling him about while dressings are being applied; that prolonged and heavy sedation not only relieves the pain of a wound but also relieves the discomfort incidental to the patient's remaining in one position a long time; that the patient, after he is in his room, is either lying or sitting, and, finally, that neuritis of isolated nerves usually is caused either by compression or by traction.

After the patient has regained consciousness, he may become aware of numbness and perhaps also of weakness of the little finger and the adjacent part of the hand, or he may find that extension of the fingers and wrist is impossible. Because of the exercise of greater care in securing the arms and providing substantial pads, injury to the ulnar and radial nerves from the edge of the operating table has become almost a thing of the past.

Ulnar neuritis in one or both arms also may appear gradually during convalescence. It generally occurs among patients who have lost considerable weight. In some cases it is due to impingement of the ulnar nerve on the bed, particularly when the patient lies for long periods on his back and the bed is hard; in other cases it appears when the patient rests his arms on the unupholstered arms of a chair.

The homologue in the lower limbs is evinced by foot drop and occasional numbness of the dorsum of the foot. Palsy of the peroneal nerve may be caused by pressure of poorly designed or inadequately padded rests used to hold the legs in the lithotomy position. It also may develop gradually after operation. In such cases pressure on the underlying mattress and traction incidental to hyperextension of the knees on a sagging mattress are responsible. Corresponding to armchair ulnar neuritis is crossed leg, peroneal neuritis. Almost always, when a patient with such a condition is interviewed, he is seated with the palsied leg crossed over the well leg. The anterior crural nerve is seldom injured, but injury of this nerve may occur after excessive external rotation of the thigh in the lithotomy position and during operations for femoral hernia. Physiotherapy, splints when indicated, and time suffice to bring about recovery in most cases. When injury to a nerve is so severe that regeneration is necessary, a helpful rule in estimating the time that recovery will require is to allow one day for each millimeter of growth needed.

The brachial plexus may be injured easily. In reviewing such cases, the author takes cognizance of three observations: first, that injury of the brachial plexus almost always occurs in women, whereas most of the aforementioned types of neuritis usually occur in men; second, that the operation has usually been on the pelvis; and, third, that the type of palsy present usually reveals involvement of the upper part of the plexus. Traction on the wrists and pressure on inadequately padded shoulder rests while patients are in the Trendelenburg position are often responsible. Radical amputation of the breast and thoracoplasty may require abduction of the arm above the level of the shoulder, a position that may cause traction on the plexus or compression of the plexus by the clavicle.

The pressure of retractors during the removal of tumors also may injure nerves. The attempted injection of solutions into the veins at the elbow may injure the median nerve. In the opening of abscesses, the long thoracic nerve, the spinal accessory nerves, and the median or ulnar nerves in the palm are among those most often severed. Poorly fitting or improperly used crutches and casts may cause pressure on the brachial plexus and on the long thoracic nerve of Bell. Volkmann's ischemic paralysis and tourniquet paralysis are much less common than they were. Nerve injuries associated with fractures and their care, obstetrical injuries to the nerves of mother or child, and serum paralysis may be mentioned. Injury of the twelfth thoracic nerve, incidental to operations on the kidneys, may result in pain which is suggestive of further trouble in the kidney.

Hysterical paralysis may simulate traumatic neuritis, and unless the true cause is discovered early, the situation may tax the psychotherapeutic resources of any physician.

The most frequently paralyzed of the cranial nerves is the sixth, which supplies the external rectus muscle of the eye. This injury has been mentioned as a rare complication of spinal anesthesia. It usually appears from seven to ten days after operation and is not permanent.

Paralysis of other cranial nerves, as well as lesions of the spinal nerves, spinal cord, and brain, and caudal lesions of one kind or another also have been reported following spinal anesthesia. They are not necessarily caused by it.

In operations on the neck, the ninth, tenth, eleventh, and twelfth cranial nerves, the cervical sympathetic nerves, and the brachial plexus may be traumatized. During tonsillectomy and dental operations, the twelfth cranial nerve and the third division of the fifth cranial nerve may be injured inadvertently. An alcoholic injection meant for the

trigeminal nerve may paralyze the oculomotor or eighth nerves.

The author considers hemiplegia to be a fairly frequent and alarming postoperative complication. Hemiplegia or other signs of vascular occlusion occasionally may be discovered when the patient awakens, but the usual interval between operation and onset of the disability is about seven days. It may occur in children or in old people, but the average age at which the accident occurs is about fifty years. This complication has occurred after operations in all fields of general surgery, and after all types of anesthesia.

Hemiplegia may also be caused by impeded circulation of the veins.

The possibility that fat embolism of the cerebral vessels may cause postoperative hemiplegia is unlikely, since the embolism is more often manifested by increasing somnolence and stupor. The author calls attention to the finding by Kernohan of large amounts of fat in the arteries of the brain after burns of large surfaces, such as occur in scalding with steam.

The question often arises whether hemiplegia is due to metastasis when the operation has been for carcinoma. This is rarely the case in hemiplegia of abrupt onset since metastatic nodules generally produce their symptoms more gradually. When hemiplegia is associated with empyema of the thorax, it may presage the formation of an abscess in the brain.

As a rule, convulsions make their appearance within ten days following operation, and they are not to be taken lightly since they are generally symptoms of some organic cerebral lesion. They may be local or general, tonic or clonic; and they are often followed by paralysis. Spinal puncture is of diagnostic help and it also may have therapeutic value.

Immediately, or several days after operation, a state of generalized lead-pipe rigidity may develop in the patient. It is a serious omen, but some patients slip into this state and out of it again and recover. The tendon and pupillary reflexes may be absent or present, there may or may not be tremor, and the patient may be clear, confused, or comatose.

When this condition occurs, the tentative diagnosis of meningitis is often made since the neck is found to be rigid. Continued application of pressure while raising the head of the patient will gradually permit complete flexion of the head on the thorax, which is not true in meningitis. When the head is released, it may sink slowly and one may even encounter some resistance when it is pushed down on the pillow. The limbs also exhibit lead-pipe rigidity and, as in the case of the neck, continued pressure during the performance of Kernig's test will enable one to extend the legs completely; the abrupt spasm noted in meningitis on palpation of the hamstring muscles whenever a given angle is reached is missing. The condition has been observed following various types of anesthesia. It also occurs, among other conditions, in some cases of pneumonia, typhoid fever, and hepatic insufficiency. The generalized rigidity impresses one as being toxic in origin, and may be classified as an extrapyramidal rigidity, presumably owing to a disturbance in function of the basal ganglia.

A somewhat similar condition, but resembling decerebrate rigidity, has been observed after spinal anesthesia in which the usual dose is administered to a patient who has profound anemia. The dose of anesthetic agent given intraspinously should be sharply reduced for anemic patients, as Lundy has emphasized, since this complication is extremely grave.

In some cases disturbance in vision, numbness of the hands and feet, paraphasia, ataxia, tremor, and mental aberration develop. The deficiencies constitute one of the most interesting and symptomatically kaleidoscopic groups of cases. They are probably much more common than is generally appreciated.

Among the complications that are most distressing to the relatives and the hospital authorities are the psychoses. Men and women are affected equally, but patients who are somewhat more than forty-five years of age are more prone to become psychotic. The type of operation, if major in scope, makes little difference.

The author notes that in reviewing these cases one soon becomes aware that one is dealing with several types of psychoses. The most common type, which more strictly may be called the "postoperative psychosis," usually does not begin immediately after operation, but after an interval of about five days and lasts for about two weeks. The outstanding features are confusion, hallucinations (especially of vision), illusions, and physical unrest. Often there is no known infection or rise in temperature. This is strikingly illustrated by patients who have gone through a postoperative psychosis with little or no elevation of temperature and then have had some severe febrile complication, such as epididymitis or pneumonia, with no return of the psychosis.

Whether the operation or the anesthetic agent contributes chiefly to the development of this psychosis is a question which has been argued about frequently, but it seems significant that when the psychosis is a "postoperative psychosis" in the restricted sense of the term, the anesthetic has almost always been given by inhalation and usually includes ether.

It seems trite to mention the matter of sedatives, but it is always advisable to review the medication the patient has been receiving. For example, when the dosage of bromides has been heavy, a restless patient may become confused and have hallucinations, which in turn may lead to an increase in the dose of sedatives. Ataxia and nystagmus are observed commonly. Postoperative delirium tremens among alcoholics was formerly not uncommon.

The psychoses associated with hyperthyroidism have attracted attention for a long time. The author emphasizes that Dunlap and Moersch warned that

thyroidectomy definitely is contraindicated in the course of severe reactions of hyperthyroidism.

When an unwonted talkativeness, euphoria, agitation, and alertness are observed in a patient who has a tendency to incorporate in his pell-mell conversation the statement that someone in the back of the room has coughed or whispered, and who has a history of previous nervous breakdowns with recovery, the earmarks of the manic phase of manic-depressive psychosis can be recognized. In such a case a psychosis of longer duration is likely and the transference of the patient to a sanitarium after the wound has healed is usually recommended.

One might anticipate that a depression of manic-depressive psychosis would be encountered more frequently, but the author believes that depressions are more likely to be complicated by operations than operations by depressions. Too often the somatic complaints of a depressed patient get him into surgical difficulties, and the surgeon must be ever on the alert to avoid operation on such patients except when delay would be fraught with danger.

Taken altogether, the postoperative mental disorders vary in type, duration, and recoverability. Most of them belong to the restricted group of postoperative psychoses. Next in frequency is the group which may safely be called toxic-infective-exhaustive psychoses, in which the psychoses immediately preceding and following operations usually are included. These in turn are followed by the deficiencies, the manic-depressive group, and, finally, by the senile, schizoid, epileptoid, mentally unstable, and other groups.

Undoubtedly some psychoses may be prevented by attention to adequate diet; by putting at rest fears the patient may have regarding his progress and what was found at operation; by providing, when necessary, an attentive, discreet, and reassuring nurse, especially at night; by the avoidance, so far as possible, of irritating noises and exasperating routine; and by seeing to it that the patient has adequate rest. These same factors apply to treatment. When the patient is fearful because of hallucinations or delusions, or when he is delirious, provisions should be made that he may not fall out of bed or escape; nurses should not leave the room for a moment without being replaced. Sedatives, restraints, physiotherapy, and hydrotherapy may be helpful. As soon as possible the patient should be taken on short excursions from his room and returned to wider contacts. When feasible he should be taken out of doors.

Lund, C. C.: The Effect of Surgical Operations on the Level of Cevitamic Acid in the Blood Plasma. *New England J. Med.*, 1939, 221: 123.

Determinations made before and after major operations on 43 patients revealed in almost every case a prompt fall of the cevitamic acid in the plasma after operation. In a few cases the level began to rise again after four or five days. Studies will be carried on to determine whether the fall observed is important from the standpoint of healing or recovery. A low plasma Vitamin-C value in blood samples drawn in the period immediately after operation may be less significant as an indication of depleted reserves than a low value prior to operation.

WALTER H. NADLER, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Dieterichs, M. M.: Articular Injuries. *Vestnik khir.*, 1939, 57: 557.

The frequency of articular trauma ranges from 6.7 to 13.3 per cent of all war injuries, according to the statistics of various nations. The appearance of clinical symptoms of infectious inflammatory processes in articulations is retarded to a certain extent by the bactericidal, anti-proteolytic, antitryptic, and other properties of the exudate. During the period of inflammation of the subsynovial tissues a collateral edema develops in the synovial membrane and is accompanied by a transudation into the articular cavity. After the inflammatory process spreads to the synovial membrane, the transudate becomes transformed into an exudate and the synovial membrane begins to display its absorptive activity. It is important to know that in spite of its purulent appearance the exudate usually remains sterile the first twenty-four, thirty-six or even forty-eight hours. After the exudate becomes septic, its resorption leads to microbiotoxic phenomena with typical septicopyemic complications.

In regard to its biological properties the synovial membrane may be compared with the peritoneum: both are quite successful in the fight against infection, provided that the cavity remains closed; otherwise infection may easily occur. It follows that all sources of infection should be removed during the long incubation period, and the synovial membrane should be closed without drainage.

Extreme conservatism is indicated if only the capsule and the synovial membrane are injured, without any trauma to the bones. The condition of the articulation is tested by repeated exploratory punctures at a distance from the original injury. The results of the bacterioscopic and bacteriological examinations of the aspirated fluid indicate an arthrotomy or a continuation of the conservative treatment.

In the presence of hemarthrosis the introduction of a trocar and aspiration of the blood are recommended by the author because its presence in the articulation more or less interferes with the function of the joint.

If a fresh, non-infected wound has not closed spontaneously but is gaping, the excision of all traumatized tissues is indicated. The author stresses the importance of a frequent change of the instruments. The articulation is irrigated with a 3 per cent phenol, a 2:1,000 rivanol solution, or a so-called Chlumsky's mixture, consisting of phenol, camphor,

and alcohol. From 5 to 25 c.cm. of the fluid used for irrigation are left in the articular cavity and the wound is closed after the introduction of a glass drain. Under favorable conditions a complete closure may be recommended. Only in the presence of streptococci is the wound left open, and Carrel's irrigation method is then employed.

If in a fresh, non-infected articular wound small fragments of bone are found, they are removed and the capsule is closed. If a relatively large cavity remains after the removal of the fragments, it is filled with some organic, inorganic, or biological substance, such as portions of muscles, and the articulation is closed. If, however, the fragments are so large that their removal would interfere with the static and dynamic conditions of the articulation, primary resection of the involved joint is indicated. It should be remembered that an atypical resection of a weight-bearing articulation frequently fails to produce the necessary coaptation of the articular surfaces, because it does not allow the development of sufficient adhesions to form an ankylosis. Therefore a typical resection is usually indicated in such cases. On the other hand, even a partial mobility of the articulations is useful in the upper extremities.

If, on account of the lack of time or unfavorable conditions, a dependable asepsis cannot be expected, it is preferable to fill the articulation with iodoform gauze and to suture the capsule partially. If after four or five days no septic condition has developed, a secondary complete closure is advisable.

It should be remembered that a secondary infection develops as a rule in exposed articulations with a prolonged drainage. Therefore, a complete closure should be attempted at the first opportunity.

If the trauma of the bones is extensive or the general condition of the patient is poor, and large blood vessels and nerves are injured, an amputation or resection must be considered.

Any attempts by unskilled surgeons to remove foreign bodies under unfavorable conditions lead to deplorable results. A bullet located in the cancellous bone of the epiphysis without a fissure is less harmful than a foreign body located in the articular cavity. An attempt to remove such a foreign body should be made only if the patient is seen not later than from twenty-four to forty-eight hours after the injury, and if sufficient time for the operation and perfect aseptic conditions are available.

Disregarding the type of surgical procedure employed, a traumatized articulation should be immobilized in a plaster-of-Paris cast or on a splint.

As to the treatment of infected wounds, watchful waiting is indicated. Amputation must be considered if a septic arthritis or an anaerobic infection of the articulation develops, because even extensive incisions are frequently followed by failure. A purulent arthritis in the form of an empyema of the articulation or a capsular phlegmon calls for arthrotomy followed by drainage and partial closure of the capsule. The glass drain should be removed after twenty-four hours if possible.

Early active and passive movements contribute to the restitution of the articular function after conservative surgical measures.

JOSEPH K. NARAT, M.D.

Loehr, W., and Zacher, K.: A Contribution to the Clinical and the Pathological Aspects of Second and Third Degree Burns; Including a Review of the Tannin Treatment (Zur Klinik und Pathologie von Verbrennungen 2. und 3. Grades; zugleich eine Kritik der Tanninbehandlung). *Zentralbl. f. Chir.*, 1939, p. 5.

This report is mainly a comparison of cod-liver-oil ointment and the Davidson tannin treatments of burns. It is remarkable that, according to reports in the literature, the latter treatment is not standardized. The tannin concentrations vary between 2.5 and 40 per cent. Often other remedies, such as trypaflavin and acriflavin, are added to this treatment. Further difficulties in the proper estimation of results are due to the fact that the statistics studied do not always distinguish between the three degrees of burns. No doubt, Loehr's 1,843 cases of burns, abrasions, injuries from high tension currents, and burns resulting from nitrous gases are to date the largest number ever treated with one and the same medicament: mynentolan.

According to statistics, tannin therapy has definitely reduced the mortality between 10 and 20 per cent. However, Wollesen claims that there still is a mortality of 9.5 per cent. Loehr in his 438 reported cases of second and third degree burns (considering this series only) reports only 25 deaths (4.8 per cent). These included all unclassified deaths, also those of patients brought to the hospital late, and those in a dying condition. It is a well established fact that most of the early deaths following burns occur within a period of forty-eight hours. Of Loehr's 21 deaths, 11 belonged to this type. It is interesting to note that tannin therapy did not decrease the number of early deaths. The deaths occurred during primary or secondary shock within forty-eight hours, and he accurately defined the causes. He cited especially the different toxins which were found to date following burns: cyanic solution, pyridin bases, and methylguanidin.

According to H. Pfeiffer's researches there is an explosion-like surfeiting of the blood with peptolitic ferments, which cause severe damage by their catalytic actions. This theory seems especially valuable to the author. The treatment with cod-liver-oil ointment produces the lowest mortality to date, and Loehr claims that it heals the greatest defects, such as necessitate transplantations or other operative procedures. He believes that his method is simple and safe even in inexperienced hands and that it is applicable in mass emergencies. The absolute painlessness of the after-treatment is an additional great advantage; also its applicability to different sites, like the face, which is not true with tannin. Loehr criticizes in detail the therapy employed heretofore, and condemns medicaments containing poisons and

those prepared with heavy metals; he also condemns the Wismuth burn-bandage, the Stahl calcium-liniment, and, above all, the indifferent salves, because the usual colors are not sterile. Cod-liver oil has the advantage of being sterile in itself; and his investigations proved that bacteria cannot continue to exist in it; they are gradually annihilated. The so greatly feared secondary infections following burns are thus prevented. Not one of the late deaths in Loehr's cases was caused by infection.

The supposed advantages of the Davidson tannin therapy are: (1) by means of the eschar formation the plasma and the water loss is prevented; (2) the burnt tissues are devitalized, which prevents the resorption of the toxins of the burns; and (3) the secondary infection is prevented.

Objections to the tannin therapy are: (1) eschar formation occurs only in colloid fibrous tissue (Fuerst); (2) Seeger insists upon an alkalinization of the tannic acid, because acid solutions cause swelling and edema of healthy living tissue; (3) eschar formation does not take place early enough (It requires from twenty-four to forty-eight hours, hence, the poisoning of the body is not prevented rapidly enough. On this account, several authors applied silver-nitrate solutions after using the tannin solution in order to hasten escharosis); and (4) when the tannin cicatrix disintegrates, heavy phlegmons form.

Loehr produced second and third degree burns on the skin of pigs' necks by applying hot soldering irons, for the purpose of establishing the difference between cod-liver-oil and tannic-acid therapy. On the third, sixth, and ninth days fragments of the burned skin were excised for histological examination. Seven photomicrographs in the original article illustrate the findings. Most remarkable in the tannin treatment is the very minor reaction of tissues not involved in the burns (Stupor). This occurs about the sixth day when the tannin eschar bursts. The burns treated with cod-liver-oil are about three days in advance of those treated with tannin.

Loehr added a report with illustrations of a suppurative cancer of the lymphatics of the breast. This was treated by thermocautery before a radical operation was done. In this case Loehr caused a deep burn extending into the musculature by applying an electrocautery through a metal placed on the skin at the edge of the cancer. This was done because such a deep burn was not produced in the pigs. These burned human skin fragments were treated by both methods. The tannin was found to be effective only in mortified tissue parts containing colloid fibers. In subcutaneous fatty tissue small bits of tannin crusts floated in superficial parts of the crater only, without even a trace of penetration into the deeper-lying tissue or influence on the masses of deeper necrotic layers.

As to the end-results, tannin was not effective in third degree burns. It is effective in first or second degree burns if, in addition, silver nitrate is used. In this respect it compares very favorably with the ambrine method (paraffin, "Kautschuk" guttapercha) rated so highly in England and France; or, with minor reservations, it is on a par with the silver-foil treatment of Lexer, as the superficial necrosis is coagulated and the secondary infection is thereby prevented. (Franz). Mathias J. Seifert, M.D.

Kalmanovski, S.: Experimental Results Regarding the Pathogenesis of Burns (Einige Ergebnisse ueber die Pathogenese der Verbrennung im Experiment). *Chirurgija*, 1938, 5: 3.

The pathogenesis of death due to burns is as yet not clear. The different authors solve the problem regarding death due to burns in various ways. The underlying factors are: intoxication, concentration of the blood, metabolic changes, and the rôle of the nervous system.

The presence of an intoxication in burns is accepted as well as denied. To evaluate an intoxication Pfeifer suggested the determination of the anti-tryptic index of the blood. The author investigated this index in 8 rabbits and 1 rat with artificially induced burns of like extent. The anti-tryptic index remained stationary for twenty-four hours or was only moderately elevated; it reached a maximum after two or three days and remained elevated for about one month. In 2 rabbits which died within twenty-four hours, the index was the same as before the burn; in the rat which died within two days it was only slightly elevated. The height of the anti-tryptic index is not in direct relation to the death caused by a burn. The change of the antitrypsin is not specific for burns and cannot be employed as an indicator for the degree of intoxication due to burns. There is no objective proof of the existence of an intoxication. Blood changes begin immediately, even during the process of burning. The high temperature causes destruction of the erythrocytes. After twenty-four hours there is no further trace of hemolysis.

Of greater importance is the concentration of the blood. This theory was formerly believed by many, later overlooked, and now again is presented, especially by the Americans, as part of the burn pathology. According to Underhill the anhydremia, the slowing of the blood stream, and the tissue asphyxiation produce shock with lowered blood pressure and toxemia, and later death. Clinical observations show elevations of the hemoglobin and of the red-cell count in the blood of burn patients. The author made erythrocyte and hemoglobin blood determinations on 11 rabbits with burns. He found a suddenly appearing concentration of the blood lasting twenty-four hours, which was followed by four days of blood dilution below normal; finally the blood returned to normal. The causes of the concentration are the loss of plasma in the region of the burn. Two rabbits died within one hour of the burn; both revealed marked retroperitoneal edema, and in both cases the spleen was extremely small. Probably the erythrocytes of the spleen-depot, which is shrunken as a result of the high temperature, take part in the concentration of

the blood. Shrinkage of the spleen is also observed in anaphylactic and in peptone shock. The plasma loss of the blood is not specific for burns; it occurs in every artificial or inflammatory stasis. The degree of the concentration of the blood is variable. The greatest increase in the number of red cells was 70.4 per cent, and the greatest increase in dried residue was 15.5 per cent. The importance of the blood concentration in the pathogenesis of burns can probably not be denied; however, it is not the only factor in the death and clinical picture. The rabbit with the greatest concentration of blood remained alive; also, according to clinical observations, death occurred in many instances after the concentration of the blood had returned to normal. The mechanism of the anemia immediately following the increase in concentration has also been investigated but very little. It is still not entirely clear. Metabolic changes following burns, also, have been investigated but little. The temperature reaction of the different species of animals is also variable. In the small animals a temperature drop can be ascertained nearly always; dogs react variably. In the adult human being a drop in the temperature does not seem to occur very frequently; it may last only a short time and therefore is not determined. The body temperature will probably drop more readily in animals, which with a lowered heat production also have an increased loss of heat, i.e., in smaller animals with their relatively larger body surface. The author investigated the temperature in 12 similarly burned rabbits. In 5 instances the temperature was elevated after five minutes, for a short time only, and probably because of the warming of the entire body of the animal by the burn. In burns of a smaller area no elevation of temperature set in. A drop in temperature occurred within eight minutes, and the greatest drop occurred within two hours after the burn. The drop in temperature extended to 12.7 degrees. Two animals with a drop of 9.4 degrees and 12.7 degrees, respectively, succumbed. Others, even with a drop of 9.5 degrees, remained alive. The temperature came back to normal in 2 animals after twenty-four hours, in 6 others after three days, but in the others it remained low for a longer period.

Gaseous metabolism determinations were made on 12 rats (method of Paschutin) before and after the burns. Each determination lasted two hours. The metabolic rate falls after the burn for four hours, probably also for longer. Oxygen consumption fell on an average of 17.5 per cent. Three rats with a drop in the rate of 39, 35, and 33 per cent, respectively, died within twenty-four hours. Two rats died after two and five days, respectively. The others remained alive, even 1 with a drop in the rate of 33 per cent. In 2 rats there was no change in the rate. Twenty-four hours after the burn the basal rate is normal, and then it begins to rise. The decrease in the oxidation processes after the burn is undoubtedly not without significance for the body, and can become so precarious that a compensatory effect will not set in. The temperature drop seems to prove this. It is less a question of increased loss of heat than of diminished production of heat. Warming a burned animal in a controlled thermostat improves the condition, and sometimes saves its life. The human being suffering from a burn, and especially children, should be kept warm, and this is of paramount importance. After a burn, oxygen consumption becomes less than the elimination of carbon dioxide, therefore the respiratory coefficient drops and does not return to normal for about twenty-four hours. The quantitative decrease in the gaseous metabolism is not so much typical for the action of a burn as the qualitative change. The author concludes from his experiments with burns on starving rats that these changes are present in all disturbances of the carbohydrate metabolism. The carbohydrates apparently are not oxidized completely; the blood sugar is elevated. He believes that there must be some relationship between hyperglycemia and the simultaneous increased adrenalin secretion into the blood stream. There are similarities between the changes in the organism following burns and those following traumatic shock. In one experiment of the author's on a rat, in which he produced a fracture of the femur, there was a change in the basal metabolism similar to that following burns. The author believes that the drop in blood pressure after burns is due to the observed vessel collapse. The clinical picture of extensive burns is very similar to that of traumatic shock. Many consider death due to burns as being the result of shock. The author does not wish to deny this in those cases in which death takes place during the actual burning or immediately after, but, according to him, there are still other factors to be considered, such as the influence of the nervous system, the circulatory system, the endocrine system, and the metabolism. He does not concede that a specific intoxication by split protein products has been proved.

(Hoheisel). Leo A. Juhnke, M.D.

Amidon, E. L.: Hematological Studies in Acute Infections. *J. Lab. & Clin. Med.*, 1939, 24: 1009.

The value of the white and differential counts in acute infections is accepted generally, as is also the "shift," as determined by Schilling. Valuable informative evidence can also be obtained from the qualitative changes in the neutrophiles. The purpose of this work is to determine the relative value of these different methods.

Several methods were employed in examining the same blood, and the information thus gained was evaluated and compared. These methods consisted of: (1) total white count; (2) differential count; (3) estimation of the percentage of young neutrophiles; (4) estimation of the percentage of neutrophiles containing "toxic granules;" (5) estimation of the percentage of neutrophiles showing severe damage; and (6) calculation of the "index of resistance."

The "index of resistance" was calculated from the formula, (T-10)-(P-70), in which "T" represents the

total white count in thousands, and "P" represents the percentage in neutrophiles. It is apparently of little significance when the white count is less than 10,000.

Of a group of 22 patients with appendicitis (14 of the appendices were gangrenous and 8 presented a mildly acute condition) 100 per cent showed an increase of non-filamented cells; 73 per cent an increase of "toxic granules;" and 43 per cent an increase of recognizable degenerated neutrophiles. The percentage of non-filamented cells was therefore found to give more accurate information regarding the presence and severity of the process than the percentage of either toxic granules or degenerated cells.

In 10 patients with pneumonia, the percentage of non-filamented cells gave the most helpful and accurate index, and this was confirmed very closely by the percentage of degenerated cells. The percentage of toxic granules was of little help.

In 21 patients with miscellaneous infections, the percentage of non-filamented cells indicated a condition more frequently in accord with the clinical findings than either of the two other percentages.

For accuracy of information, speed, and ease of execution, it appears that determination of the percentage of non-filamented cells constitutes the most valuable qualitative examination in this group of infections.

The determination of degenerated cells requires a degree of training and technical skill that is not to be expected of the average hospital technician.

SAMUEL KAHN, M.D.

Heller, A. M., and Medvedeva, T. I.: The Rôle of Anaerobic Bacteria in Noma. Clinical and Experimental Observations. *Vestnik khir.*, 1939, 57: 409.

The authors treated 14 cases of noma or gangrenous stomatitis by excision of the necrotic tissues followed by an application of iodine and potassium-permanganate solutions. The oral cavity and the defect resulting from the operation were irrigated twice or three times daily with a warm potassium-permanganate solution, and a high caloric diet was prescribed. In none of the 14 cases did the authors succeed in arresting the progress of the condition, and all 14 children succumbed to noma.

In 53 other cases this treatment was supplemented by the administration of an anti-perfringens serum. Under the influence of the injections the edema diminished, the pathological infiltration of the tissues disappeared within four or five days, and cicatrization followed. In cases with extensive necrosis a cessation of the process was obtained and gradually healthy granulations appeared. Moreover, the general condition of the children improved and apathy was replaced by considerable activity and an improved appetite.

In 15 cases blood cultures were made and in 5 of them the bacillus perfringens was isolated; the remaining 11 cultures were sterile.

The authors conclude from their investigations that the presence of perfringens bacilli in noma is not accidental; it aggravates the condition considerably, and in many instances is responsible for the spreading of the necrosis and toxemia. The use of a specific anti-perfringens serum is logical because clinical and laboratory observations show its efficiency and point to the presence of toxemia in noma.

Fusospirochetosis accompanying noma should be considered as a secondary infection which contributes to the seriousness of the condition.

The proper treatment of noma consists of a combination of surgical procedures, especially an excision of the necrotic tissue, with the employment of anti-perfringens serum.

JOSEPH K. NARAT, M.D.

Hamlin, E., Jr., and Sarris, S. P.: Acute Gonococcal Tenosynovitis: Report of 7 Cases. *New England J. Med.*, 1939, 221: 228.

Seven cases of acute gonococcal tenosynovitis are reported by the authors. Five of these cases were seen within the last eighteen months and constitute one-third of the number of cases of acute tenosynovitis seen during this period. The authors believe that acute gonococcal tenosynovitis is far more common than reports indicate. The cases should not be treated as the ordinary pyogenic infection of the tendon sheath because the end-result may be poor.

The subjects of cause and pathology are not described other than that the character of the pus found in the tendon sheath is similar to that seen pouring from the fimbriated end of a fallopian tube acutely infected with gonococci.

Gonococcal tenosynovitis should be suspected in any case in which there is no history of antecedent trauma, in which there is a concomitant primary focus of gonorrhea, and in which the signs and symptoms appear less severe than their duration would suggest. However, these factors should not be relied upon to make the diagnosis. In each case reported the classical signs of acute tenosynovitis were present, but in only 1 were they as marked as would have been expected had the infection been from the staphylococcus or streptococcus. Redness, tenderness, swelling, and limitation of motion were always observed, but in only 1 case were they particularly severe, and in some of the cases the infection seemed to be localized in only a part of the tendon sheath rather than to extend so as to involve the entire structure. The general systemic reaction to the infection was only slight.

Once the diagnosis is suspected it may be established only by means of a positive smear or culture of the pus in the tendon sheath. This may be done by aspiration of a specimen of pus from the tendon sheath under aseptic technique. Anesthesia is not required. The puncture is best made through the center of the middle flexion crease, at which point the tendon sheath is very superficial. The material obtained should be smeared, stained, and examined

immediately before exploration is done. Cultures should also be made. This method of procedure was used only in the last 3 cases but has proved successful.

If the aspiration does not yield sufficient pus or if for any reason the diagnosis cannot be established, then an exploratory incision should be made under general anesthesia and with a bloodless field. Further smears and cultures are taken from the tendon sheath. If gonococci are found the incision is closed. If gonococcal tenosynovitis is strongly suspected the incision may be closed and the result of the cultures awaited.

For culture of the gonococcus the pus is immediately streaked on ascitic agar plates. The plates are then placed in jars into which carbon-dioxide gas is blown; then the jars are sealed and incubated.

The optimal treatment for gonococcal tenosynovitis is immobilization with application of local heat, and not incision and drainage as generally recommended. With the advent of sulfanilamide and the excellent results attributable to this drug in gonococcal infection, it appears all the more evident that if a diagnosis of gonococcal tenosynovitis can be established, surgery is not only unwise but contraindicated.

A word of caution is added: conservative treatment should be instituted only if the gonococcal origin has been established. The danger of postponing incision and drainage of acute tenosynovitis caused by common pyogenic organisms is well known. If real doubt exists as to the causative agent then a case of acute tenosynovitis should be handled in the classic manner.

In the 7 cases reported, 3 of which were aspirated and 4 drained, the results have all been good. No serious permanent deformity occurred because there was no secondary contamination in the cases operated upon. It is probable, however, that they did well in spite of the treatment rather than because of it.

The reports of the 7 cases are given. There was a question as to the traumatic origin in only 2 cases. In 4 cases a primary focus of gonococcal infection was found. HARVEY S. ALLEN, M.D.

Browning, C. H.: The Present Position of Chemotherapy with Drugs of the Sulfanilamide Group. *Brit. M. J.*, 1939, 2: 265.

The author presents a general perspective of the voluminous literature on sulfanilamide and refers to unpublished work in which he has participated. Attention is called to the fact that while cure of certain experimental general bacterial infections by sulfanilamide compounds is an enormous advance, the efficacy of the present drugs is by no means ideal. For example, when mice are concerned sulfanilamide is surpassed by M & B 693, rodilone, and especially by the related mono-acetyl p-p-diamino-diphenyl sulphone. With all of these the range of effective dosage is not wide, and to be most successful treatment must be begun early. Further work on the absorption and excretion of members of the series, and on the chemical transformations which they may undergo in the body, as well as clinical observation, is necessary in order that the best drug, the amount to be administered, and the spacing in time may be ascertained. When conditions favorable to general infection have arisen, prophylactic use of the sulfanilamide group should be valuable. When infection has been established the best therapeutic effects are secured in acute, diffuse conditions without marked local tissue changes. Hence these drugs are not likely to obviate operative procedures when focal lesions, such as accumulation of pus or extensive necrosis of bone or other tissues, have occurred. WALTER H. NADLER, M.D.

Buttle, G. A. H.: Pharmacology of the Sulfanilamide Group of Drugs. *Brit. M. J.*, 1939, 2: 269.

The drugs in general use for chemotherapy of bacterial infections are sulfanilamide and certain of its derivatives, notably M & B 693. These derivatives can be divided into those in which substituents are introduced into the amino group and those in which they are introduced into the amide group.

The action of these drugs is discussed from the aspects of absorption and excretion, and of toxic symptoms. Clinically, blueness of the skin is by far the most common symptom. This is not necessarily accompanied by a change in the condition of the blood pigment and is generally considered to be no contraindication to further administration of the drug. Nausea with epigastric pain, with occasional vomiting, may be produced by sulfanilamide; this may disappear after the first day or two. Drug fever, sometimes accompanied by a rash, may occur from seven to twelve days after medication is started. Depression, headache, and dizziness are common, especially in ambulant patients. Palpitation, paresthesia, tinnitus, and occasionally multiple neuritis may occur. Agranulocytosis is by far the most severe condition produced, but only 15 cases, of which 9 were fatal, have been ascribed to sulfanilamide; 6 cases have been reported as being due to M & B 693. A blood count every third day is advised in the cases of all patients who receive the drug for more than ten days. Hemolytic anemia is also rare. The most troublesome symptoms following the administration of M & B 693 are nausea and vomiting. Several instances of hematuria have been reported. WALTER H. NADLER, M.D.

Zayteff-Jern, H., and Meleney, F. L.: The Effect on Bacteriophage of Prontylin, Sulfapyridine, and Other Antiseptics and Dyes Used in Surgical Practice. *J. Lab. & Clin. Med.*, 1939, 24: 1017.

Bacteriophage is susceptible to, and is destroyed by, certain of the stronger antiseptics. There is a differential susceptibility to some of the weaker antiseptics, the staphylococcus bacteriophages being regularly more susceptible than those of the bacillus coli. The latter in turn are more susceptible than those of the bacillus pyocyaneus. Therefore, anti-

septics in general cannot be used with bacteriophages in the treatment of mixed infections. Zinc peroxide is no exception to this rule.

Prontylin, sulfapyridine, and prontosil do not interfere with bacteriophage action. It is therefore possible to combine the use of sulfanilamide and sulfapyridine with bacteriophage in those mixed infections which are caused by the hemolytic streptococcus combined with the staphylococcus or the bacillus coli. This combined method has been used with gratifying results in a number of cases.

SAMUEL KAHN, M.D.

ANESTHESIA

Nagel, M.: The Advantages and Disadvantages of Pernocton Narcosis in Surgery (Ueber Vorzuege und Nachteile der Pernokton-narkose in der Chirurgie). *Deutsche med. Wchnschr.*, 1938, 2: 1686.

This work is based upon 1,820 anesthesias with pernocton. Preliminary doses of 10 mgm. of morphine and 0.3 mgm. of scopolamine were given an hour before the anesthesia itself. Pernocton is used only as a basal anesthetic in a maximum dose of 5 c.cm. Full effect of the agent is obtained by supplementing it with small amounts of ether (pernoctoncombination anesthesia). The more slowly and uniformly the drug is injected (2½ c.cm. per min.), the more satisfactory is its action. From twelve to fifteen minutes should be allowed for its administration. The depth and the duration of the sleep are very extended and therefore the supplementary agent, ether, need be given only sparingly. In almost all cases about 50 c.cm. of ether suffice to give relaxed anesthesia for over an hour. This is due in part to the use of the economical Ombrédanne ether mask.

Further advantages of pernocton are:

1. Uniform depth of the anesthesia. The possibility of the combination of pernocton with local anesthetic agents is particularly useful in abdominal work.

2. Freedom from danger. This end is readily attained by grading the individual dose. The intravenous administration of coramine is a specific remedy for untoward effects.

3. Fewer postoperative complications. In the cases anesthetized with pernocton no true pneumonias were seen. This result was due in part to the use of the Ombrédanne mask and in part to the careful postoperative regimen: breathing exercises, the early rising of all patients, the use of large mustard plasters for from fifteen to twenty minutes in all cases showing respiratory symptoms, and the energetic use of quinine therapy (quinine-calcium Sandoz). As a result of these measures postoperative thromboses are seldom observed. Use of the drug in kidney disease and even in eclampsia is not contraindicated.

4. Psychic and postoperative excitement is decreased. Since pernocton can be given directly in the patient's own room with appropriate verbal suggestion, an excitement stage is practically eliminated. In postoperative states unpleasant "hangover" effects, which with inhalation anesthesia often last for several days, are completely lacking.

In contrast to pernocton which is given for operations that are known to take relatively long periods of time, evipan (alone) is given for short anesthesias in cases in which complete muscular relaxation is required, as for instance, in the reduction of fractures and dislocations. In cases of cesarean section the use of pernocton basal anesthesia supplemented by the Ombrédanne mask is contraindicated because of possible asphyxia of the child. The least danger in such cases is afforded by ether administered by the open drop method.

(F. O. MAYER). AUGUST JONAS, JR., M.D.

Rovenstine, E. A., and Cullen, S. C.: The Anesthetic Management of Patients with a Hyperactive Carotid-Sinus Reflex. *Surgery*, 1939, 6: 167.

The carotid sinus is one of the reflex centers which maintains control over the activity of the vascular and respiratory systems. The carotid-sinus reflex may be initiated by either external or internal stimuli, and results in circulatory or respiratory adjustments. Initiators of the carotid-sinus reflex are: (1) chemical changes in the blood itself, (2) variations of pressure in the arterial tree, and (3) mechanical pressure or surgical traction of the carotid arteries at their bifurcation. Thus two types of receptors may be described: (1) the chemical receptors, and (2) the pressor receptors. Anatomically, the chemical receptors are located in the carotid body. They are stimulated by body biochemical changes, such as oxygen lack or carbon-dioxide excess, and exert their main influence upon respiration. They are best called carotid-body receptors. The pressor receptors are located in the carotid sinus which is innervated by the carotid sinus branch of the glossopharyngeal nerve. The latter are best called carotid-sinus receptors. Their efferent pathway is through the vagus and cervical cardiac sympathetics. The physiological effect would therefore be manifested on the heart and circulation. Thus in the normal individual an increase in the arterial tension or, more specifically, an increase of pressure in the carotid sinus causes a lowering of the blood pressure and a decrease in the heart rate. The carotid-sinus reflex and receptors can be affected by anesthetic drugs, the anesthetic technique, hemorrhage, and operative manipulation. Any factors which depress or abolish the normal carotid-sinus reflex result in destruction of the normal compensatory mechanism against hypotension (shock).

The circulatory collapse caused by severe trauma, hemorrhage, high spinal anesthesia, anoxemia, and inhalation narcosis may be associated with paralysis of the carotid-sinus reflex.

The carotid-sinus syndrome is the clinical signs and symptoms which result from abnormal function of this reflex center. The untoward symptoms consist of: (1) psychic changes, (2) fainting spells, (3)

periods of unconsciousness, and (4) generalized convulsions. The carotid-sinus syndrome may be manifested as one of three types: (1) the vagal type, recognized by bradycardia, asystole, arrhythmia, hypotension, and cerebral anemia; (2) the depressor type, associated with a vasomotor response of lowered blood pressure, but no changes in the heart rate; and (3) the cerebral type, wherein clinical symptoms exist but there are no signs of vasomotor or heart alterations.

It is essential in the diagnosis of these cases to identify the type of syndrome. By the aid of electrocardiographic tracings the vagal and vasomotor types can be recognized. Pharmacological tests are best for the identification of the type of carotid-sinus syndrome. Atropine sulphate (1/150 gr.) will abolish the vagal type. Epinephrine or ephedrine eliminates the depressor type. There is no drug at present which has any effect on the cerebral type.

Carotid-sinus sensitivity may be demonstrated clinically by a simple mechanical test. The patient is permitted to sit in the upright position. The sinus is located by drawing a horizontal line across the level of the lower angle of the mandible. This line, where it meets the lateral border of the sternomastoid muscle indicates the level of the bifurcation of the carotid artery. Pressure over this area for from twenty to thirty seconds in a hyperactive carotid sinus will elicit the clinical signs of bradycardia, hypotension, and syncope.

The carotid sinus may be blocked with procaine. At the level of the fourth cervical vertebra over the transverse process a skin wheal is raised. A 50 by 7 mm. gauge needle is advanced to touch the transverse process. The needle is withdrawn slightly and directed anteriorly for about 1 cm. Ten c.cm. of a 1 per cent procaine solution are then deposited in this area. Care must be exercised not to puncture the large vessels of this area. A successful block is often associated with hoarseness and cough due to anesthetization of the recurrent laryngeal nerve which is anatomically close to the carotid sinus. Pressure over a hypersensitive sinus blocked by procaine will no longer elicit the clinical signs mentioned above. In such a case the diagnosis is definitely established and a periarterial sympathectomy is indicated.

The effect of drugs on the carotid sinus especially in pre-anesthetic medication is of importance. The barbiturates diminish the vagal and depressor types. Evipal, pernocton, and pentothal completely inhibit the latter two types. Luminal and barbital do not affect the carotid-sinus reflex. Digitalis increases excitability and may induce cardiac arrest and arrhythmia in the presence of an excitable carotid sinus. Atropine and scopolamine inhibit the vagal type of sensitivity.

Nitrous oxide, ethylene, and cyclopropane have no effect on the reflex. Ether, vinethene, and chloroform depress the sinus with deep narcosis and stimulate it with light anesthesia. Avertin makes the sinus more sensitive. Cocaine and its allied drugs abolish the reflex when they are applied locally over the sinus.

The authors describe the management of a case in which operation was done for carotid-sinus hypersensitivity by periarterial sympathectomy of the carotid arteries at the bifurcation. Morphine, less than the usual pre-anesthetic amount, was given subcutaneously about two hours before operation. The anesthetic agent used was cyclopropane since it does not affect the sinus reflex and allows for the use of high concentrations of oxygen. Endotracheal intubation was done to permit a patent airway and rapid control of the narcosis. The carbon-dioxide absorption technique was used as the anesthetist can then control the oxygen and carbon-dioxide tensions.

The anesthetist carefully watched the pulse and blood pressure. It is he who recognizes completion of the denervation by the rise in blood pressure, increase in heart rate, and rise in arterial tension.

Carotid-sinus hyper-reflexivity may occur during the course of an operation. The anesthetist may recognize the onset of such a condition by a bradycardia, a fall in the arterial tension, and a diminution in the pulse pressure. The patient exhibits signs of syncope, a cold wet skin, and pallor. When this is recognized the operation should be temporarily discontinued. The anesthetic agent should be discontinued and oxygen given. If the operation is in the cervical region, all retractors and packs or other instruments should be removed. A procedure of specific value is to inject from 3 to 5 c.cm. of 2 per cent procaine in the carotid bifurcation. Intravenous medication and stimulating drugs are of no value. The authors believe that many of the sudden deaths described in the surgical literature, especially after simple incision and drainage of cervical abscesses, may be explained on the basis of circulatory collapse associated with carotid-sinus hypersensitivity. BENJAMIN G. P. SHAFIROFF, M.D.

Woodbridge, P. D., Horton, J. W., and Cornell, K.: The Prevention of Ignition of Anesthetic Gases.
J. Am. M. Ass., 1939, 113: 740.

Experiments were conducted under conditions which duplicated as nearly as possible those existing at the time of a recent fatal anesthetic explosion in a Boston hospital. The investigation led to the following conclusions:

1. Adequate protection against electrostatic sparks is not necessarily obtained by a relative humidity as high as 60 per cent.

2. Cushions on the anesthetist's stool constitute such a serious hazard that they should not be permitted.

3. Intercoupling near the gases, as by wire wound around the breathing tubes and metal contact to the patient's cheek, is believed to present the following serious hazard:

If, when the mask is being removed, the interruption of the connection between the chain and the face should occur simultaneously with some event

tending to produce a charge on the patient or on the machine, there might well be a spark discharge between the face and the chain. This spark would of necessity occur directly in the spill of explosive gas from the machine. There is a further hazard due to the possibility of a break in the wire where it is embedded in the rubber. This break may occur in such a way as to introduce a spark directly into the explosive mixture. If metallic electrical connection is to be maintained between the patient and the gas machine, the conductor should be placed at a distance from the breathing tubes and mask. It must be so arranged that it need never be disconnected while explosive gases are present, because disconnection of an effective conductor will produce a gap across which a spark could jump.

4. Previous reports as to the hazard involved by wool and silk were confirmed. Woolen blankets, and silk and woolen outer garments should never be allowed near explosive gases. Undergarments of either silk or wool do not constitute an electrical hazard. To produce a charge from such fabric it is necessary first to rub it with some other material and then to separate the two. If the two are not separated there can be no electrical potential.

5. It was immediately obvious that the ideal method for complete removal of the possibility of an electrostatic potential between any two objects in an operating room, and thereby for prevention of any spark discharge which might ignite an explosive mixture, would be to interconnect all objects and persons by conductors between these bodies or from these bodies to a conducting floor, which would then serve as a common interconnector. This method is believed to be impracticable with any means that have as yet been made available. However, it is possible by intercoupling to reduce certain specific hazards of frequent occurrence. A method is proposed, based on the assumption that under normal conditions of administration of anesthetic gases no mixture of explosive concentration is likely to exist in an operating room outside of a region of about a foot in radius surrounding any gas leak. The patient, the gas machine, and the anesthetist should be so intercoupled electrically that sparks cannot occur between them. The major portion of all electrostatic potentials having dangerous possibilities is thus eliminated. The operating table may be included in this group with advantage.

The intercoupling connectors should be of high resistance in order to prevent shock to the patient from accidental contact with the lighting circuit. Also, when connectors of high resistance are used for intercoupling, electrostatic sparks between connected objects will be adequately prevented. If the floor of the operating room is electrically conductive, it should be included in the intercoupled group.

A unit to maintain the desired interconnection has been made available, and may be obtained from the Technequipment Company, Brookline, Mass.

The authors sound the warning that the use of this high resistance intercoupling in no way eliminates the need for other precautions against static spark. These precautions include the maintenance of high relative humidity in the operating room, the wetting of rubber parts before use, the avoidance of the use of cloth covers on anesthesia machines, and care that the breathing bag is not removed during anesthesia to dump its contents. Electrical apparatus used in the operating room must be maintained in good repair to prevent defects.

SAMUEL H. KLEIN, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Robb, G. P., and Steinberg, I.: Visualization of the Chambers of the Heart, the Pulmonary Circulation, and the Great Blood Vessels in Heart Disease. *Am. J. Roentgenol.*, 1939, 42: 14.

The method of visualization of the heart described by the authors consists of 2 essential procedures: (1) the rapid intravenous injection of enough radiopaque solution into the blood stream to make the interior of the heart opaque to the roentgen ray during the first circulation, and (2) the making of roentgenograms of the cardiovascular structures at the moment of their opacification. The interval between the injection and the arrival of the radiopaque solution in the various parts of the cardiovascular system is remarkably short, and it should be gauged beforehand by measuring the "arm to lung" and the "arm to carotid sinus" time of circulation to the right and left sides of the heart. The position of the patient during visualization must vary with the structures to be outlined; the optimal degree of rotation is determined by roentgenoscopy in each case. With 1 injection, and the 2 roentgenograms provided by the ordinary stereoscopic casette shifter, it is possible to visualize the right side of the heart and the pulmonary arterial tree practically every time; the left cardiac chambers and the thoracic aorta can be visualized in about three-quarters of the cases.

The experience of the authors now consists of 263 injections in 140 patients. The immediate reaction to the injection is mild and transient even in patients who are seriously ill; delayed effects are unimportant. There has been no fatality or other serious consequence. The authors outline in detail, with case reports, their findings in rheumatic and hypertensive heart disease, and syphilitic and arteriosclerotic cardiovascular disease.

The prominence of the pulmonary arc in the frontal view, in patients with rheumatic mitral stenosis and insufficiency, was caused directly by the dilated pulmonary artery and not by the enlarged pulmonary conus or the left atrium; the left auricula formed the convexity immediately below the pulmonary arch. Elevation of the left bronchus was not caused by the left atrium, but apparently by engorged pulmonary veins. In syphilitic aortitis, the intracardiac portion of the aorta (the most frequent site of involvement and one previously invisible) was outlined, and the exact size, shape, and location of aneurysms of the aorta were determined. The degree of left ventricular hypertrophy and dilatation, the tortuosity and unfolding of the thoracic aorta, the "buckling" of the innominate artery, and the identity of the vessel forming the anterior boundary of the "aortic triangle" were demonstrated in hypertensive heart disease. In the patient with arteriosclerotic cardiovascular disease, the heart was found to be normal in size, the apparent enlargement in the conventional roentgenogram being due to the deviated spine; the aorta exhibited a moderate degree of dilatation, elongation, and unfolding, with calcification and thickening of the wall.

From these preliminary observations it seems apparent that inference regarding the condition of the heart which is based upon grossly indirect evidence, such as the alteration of the cardiac silhouette and the disturbance of adjacent structures, can now be largely replaced by exact information obtained by separate visualization of the 4 chambers of the heart and the great blood vessels. As a consequence, the interpretation of conventional roentgenoscopy and roentgenography will become more accurate and enhance the value of these widely used clinical methods of examination, and ultimately will make visualization of the chambers of the heart and the thoracic blood vessels necessary only in cases presenting unusually difficult diagnostic problems.

HAROLD C. OCHSNER, M.D.

Polgár, F.: The "Cut-Off" of the Diaphragm Line: A New Diagnostic Symptom in Chest Radiography. *Acta radiol.*, 1939, 20: 219.

The differential diagnosis between small fluid accumulations in the costophrenic angle and infiltrations in the lungs in this area is often very difficult. In attempting to make such a diagnosis the author observed that densities within the lung ended abruptly along the edge of the lobe and could be demonstrated by examinations made at proper angles. In the right phrenicocostal sinus, the marginal contour was cut off by intrinsic densities at its point of intersection with the great interlobar fissure, i.e., where the middle and lower lobes meet. He calls this sign the "cut-off" symptom and believes it makes reliable differential diagnosis possible in the majority of cases. If the shadow in the sinus is caused by an accumulation of fluid, the basal medial border of the shadow appears quite different. In case of a typical cut-off, the border between free and shadowed parts of the diaphragm is sharp and coincides with the incisura interlobaris. The point of cut-off is located anteriorly, behind the anterior chest wall. In contrast to this, small exudates are, as a rule, found in dorsal regions and have a quite different roentgenographic appearance.

ADOLPH HARTUNG, M.D.

Krogdahl, T.: The Roentgen Diagnosis of the Perisigmoiditic Infiltration (Ueber die Roentgendiagnose des perisigmoiditischen Infiltrats). *Acta radiol.*, 1939, 20: 241.

While ileocecal tuberculosis, and appendicitic infiltration principally, may present difficulty in the roentgenological differential diagnosis of perisig-

moiditic infiltration in the proximal portion of the colon, non-specific, tumor-forming peridiverticulitis plays the most important part in the distal portion. Not only does the sigmoid colon and the adjacent portion of the descending colon represent the site of predilection for both diseases, but these diseases are typical of senescence and are rarely associated with definite differential diagnostic signs. As compared with peridiverticulitis, other inflammatory and more or less markedly tumor-forming and stricturing processes play a subordinate part in this respect, partly because they occur extremely rarely in this portion of the intestine (tuberculosis, actinomycosis, typhoid, lues, anthrax, bilharzia) and partly because the history and the nature of the disease more often indicate the disease. The same factors would apply to the secondary transition of inflammatory processes from other organs (seminal vesicles, omentum, and female pelvic organs) to the intestines.

In this article, only those forms of peridiverticulitis that are likely to be confused roentgenologically with cancer are discussed. The most important element in the diagnosis is roentgenography after a barium enema. The differential diagnosis of cancer offers the greatest difficulty. Both diseases present (not rarely with a palpable tumor) a more or less pronounced, often circular defect in the contrast shadow, in which the lumen is changed into a rigid tube with uneven walls and loss of peristalsis. The form and borders of the defect and the structure of the mucosal relief render a differential diagnosis possible in most cases. The diagnosis of perisigmoiditic infiltration is primarily a diagnosis of the exclusion of carcinoma. The latter shows such roentgenologically distinct and marked signs that they may be considered almost as pathognomonic, while it is much more difficult to elicit positive roentgenological symptoms characteristic of peridiverticulitic or perisigmoiditic infiltration. The evidence of diverticula is significant, but this is not always roentgenologically demonstrable and is not pathognomonic, although it is a condition *sine qua non* of the disease. Hence the question of what the roentgenologically typical signs of cancer are comes up.

The author presents the following roentgenological scheme in the differentiation between cancer and perisigmoiditic infiltration:

The findings which denote cancer are: (1) a short stenosed portion; (2) sharply defined borders of the defect running transversely with the lumen of the gut; (3) a portio-forming protrusion of the defect distally; (4) a "malignant" relief with a gradual transition into normal relief at the edge of the tumor distally and proximally, or in a typically sigmoiditic relief proximally, and absence of signs of diverticula; and (5) an unsymmetrical and partly indistinct longitudinal contour of the stenosed portion. The signs in favor of an inflammatory infiltration are: (1) a long stenosed portion, the longer this is, the less likely is a neoplasm the cause; (2) a funnel-shaped stenotic entrance and outlet with gradual transition into more normal portions of the gut; (3) a mucosal relief, characterized mostly by broad, predominantly transversely running folds without sharp transition, distally and proximally continuing in a similarly changed relief; (4) evidence of diverticula, especially within the stenosed portion; and (5) a longitudinal contour of the stenosed portion, which is unsymmetrically and quite deeply jagged with partly pointed prominences and depressions.

In spite of this evidence and most careful examination, there are cases in which a definite differential diagnosis is impossible, especially when a cancer has perforated the gut. However, repeated examinations may make a diagnosis possible. A careful roentgenological examination may also help therapeutically and in the differential diagnosis when there is a suspicion that the observed inflammatory infiltration is peritumoral. Such "antiseptic" roentgenotherapy may decrease the size of the tumor within a short time and render it more mobile and more sharply defined for subsequent operation.

LOUIS NEUWELT, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Fischer, A. W.: The Relations Between Accident and Disease from the Standpoint of the Surgeon (Ueber den Zusammenhang zwischen Unfall und Krankheit vom Standpunkt des Chirurgen). *Oeff. Gesch. dienst*, 1939, 4: 943.

Only in the last decade a revision of the theories governing the development of diseases as a sequence of trauma has been undertaken. This is the result of more critical examination of the statements given in casualty cases, with reference to the injuries. The old teaching of "Locus minoris resistentiæ" must be considered, at best, with extreme caution. Local allergic reactions in highly sensitized individuals may offer clinical manifestations that easily could be interpreted in favor of this teaching. In diseases developing most frequently from endogenous and not from exogenous causes, the strictest means of establishing the clinical sequel between a proved accident and the disease must be used; also, the location of the trauma and that of the diseased part of the body must correspond; and, finally, the interval between the date of the accident and the occurrence of the disease must be definitely known before liability can be allowed.

Without any dogmatic obstinacy, this principle also obtains in surgical tuberculosis and in osteomyelitis. In regard to the former, the author never could recognize any relation to trauma. In regard to abdominal hernias, a quite clear conception has forced itself to the fore which may account for strangulations following accidents. The anatomical findings of the hernia, however, with few definitely established exceptions, could not be classified in most of the cases as being of traumatic origin. A true accident-hernia was never seen by the author. Abdominal-scar hernias following laparotomies necessitated by accidents are liability cases. The author believes it is very improbable that gastric ulcers and their perforations are related to accidents. Gastric hemorrhage due to severe accidental abdominal pressure, or to markedly increasing the blood pressure, is more readily conceivable as a liability case. The author does not believe an "appendicitis traumatica" exists. Rupturing of the vermiform appendix is not appendicitis. An appendiceal abscess may be ruptured by trauma. There is no basis for classifying ileus and volvulus as being due to accidents. It is tenable that an invagination is of traumatic origin only when a violent trauma causes circumscribed cramps in the intestinal musculature and forces the contracted section to slip into the larger peripheral part of the bowel. In traumas of the spleen the occurrence of a bilateral rupture is always suspected. Cancer of the gastro-intestinal canal has no relation to accidents. The acknowledgment of complaints induced by adhesions caused by abdominal traumatisms, or those following abdominal operations necessitated by traumatisms, is to be very cautiously considered. The proof that these adhesions really cause disabling conditions must be subject to roentgenological corroboration. In bone and joint diseases it is always a question whether the accused accident really plays an essential part in the entire diseased condition. The so-called "overlifting" in older laborers is usually not caused by an accident; the pain is solely the first clinical symptom of senescent changes which are demonstrable.

(HEINEMANN-GRUEDER). MATHIAS J. SEIFERT, M.D.

Moon, V. H.: Early Recognition of Shock and Its Differentiation from Hemorrhage. *Ann. Surg.*, 1939, 110: 260.

The author has reviewed all records of hemoconcentration or acute erythrocytosis that could be found in the medical literature, only a few of which have been cited in this paper. The evidence summarized from these reports indicates that hemoconcentration is related etiologically to the mechanism by which the syndrome of shock develops in various clinical conditions. Most of the authors attributed hemoconcentration to the leakage of plasma through endothelium which had been rendered abnormally permeable by some injurious agent or condition.

His experimental studies have included the intraperitoneal introduction of muscle, liver, and other tissue substances, injections of watery extracts of normal tissues, of bile and its salts, peptone, bacterial cultures and toxins, histamine, snake venoms, and drugs, such as emetine, veronal, and other barbiturates. His studies also included burns, trauma, intestinal manipulation and obstructions, and the effects of proteins in sensitized animals.

Regularly, and without exception, the agents and conditions mentioned produced hemoconcentration. This appeared early, and its degree was proportional to the apparent illness of the animal. When recovery followed, the blood returned to its normal composition. When death resulted, the post-mortem findings were those which are characteristic of shock.

It appears that any agent or condition which affects capillary endothelium adversely will produce the syndrome of shock if that effect is produced systemically or in extensive visceral areas. Both the experimental and clinical observations indicate that hemoconcentration is the surest and earliest clinical sign of endothelial damage of sufficient extent or degree to cause impairment of the efficiency of the circulation.

Arterial blood pressure is not an accurate criterion of the presence of shock. The latter may be present while the blood pressure is well maintained, or even while at its highest recorded point.

Hemoconcentration is progressive; it is an index of the degree of shock, and it subsides to normal as shock is abated. Also, it furnishes a means for distinguishing between shock and hemorrhage. In the latter condition the blood is diluted to a degree proportional to the effects of the hemorrhage.

The presence of hemoconcentration is the earliest clinical sign of shock. It is easily detected, is regularly present before other signs appear, and results from the same mechanism which causes shock. Its use as a clinical test facilitates the early recognition and treatment of shock. SAMUEL H. KLEIN, M.D.

Besredka, A.: An Experimental Study of Anti-Tumoral Immunity (Étude expérimentale sur l'immunité antitumorale). *Presse méd.*, Par., 1939, 47: 1125.

Besredka reports experiments on rabbits with Brown-Pearce epithelioma. The animals were inoculated with emulsions of the tumor. It was found that if the tumor emulsion was injected into the testicle, it produced, as a rule, a malignant tumor that metastasized. If the tumor emulsion was injected intracutaneously it produced a tumor of a benign nature, even though it was histologically an epithelioma; the tumor was eventually absorbed without any ill effect on the general condition of the animal. After the absorption of the intracutaneous tumor, the animal developed an immunity, so that inoculation of the tumor emulsion into the testicle, the eye, the stomach, the skin, or any other site did not produce a tumor; however, in non-vaccinated animals such injections resulted in the growth of a malignant tumor, except when made in the skin. The vaccinated animals remained in good health.

While animals vaccinated by an intracutaneous injection of the tumor emulsion maintained their immunity against inoculation with the tumor emulsion, even at sites where the most malignant tumors developed in unvaccinated animals, this immunity could not be transferred to other animals by the injection of the serum or emulsions of the spleen or brain of the immunized animals.

The immunity produced to the Brown-Pearce tumor, therefore, is of the type of localized or tissue immunity which does not depend upon the production of antibodies in the serum. In this respect, it is analogous to the immunity to anthrax.

ALICE M. MEYERS.

Hopkins, Sir F. G.: The Importance of Laboratory Effort in Cancer Research. *Brit. M. J.*, 1939, 2: 1.

At the official opening of the New Laboratories of the Imperial Cancer Research Fund in London a general survey of cancer research was presented. The results of the experimental approach were stressed and milestones such as the discovery of the transplantability of animal tumors to other members of the same species and the isolation of carcinogenic hydrocarbons were mentioned. The pessimism inherent in the statement that cancer cannot be understood until the riddle of life itself is solved, which suggests that it never will be understood, or at least not for a very long time, was decried. The emphasis was on an optimistic point of view as regards future research, and a closer collaboration between workers in chemistry, physics, and biology.

JOHN L. POOL, M.D.

Boothby, W. M., Mayo, C. W., and Lovelace, W. R., II: One Hundred Per Cent Oxygen: Indications for Its Use and Methods of Its Administration. *J. Am. M. Ass.*, 1939, 113: 477.

According to the authors, by administration or inhalation of oxygen in any certain percentage is meant the average amount of oxygen in the total inspired air. The amount of oxygen, after correcting for water vapor in the alveolar air, is between 5 and 6 per cent lower than whatever may be the percentage of oxygen in the inspired air. They discuss the rationale of administration of 100 per cent oxygen.

In traumatic surgery, either military or civil, not only is shock of frequent occurrence but often it is accompanied by direct injury to the blood vessels; this produces local slowing of the circulation in addition to the general slowing which accompanies shock. In such conditions, the administration of 100 per cent oxygen not only combats the shock but aids in preserving the injured extremity.

In civil as well as military surgery, use of oxygen unfortunately has been looked on as a therapeutic measure to be used as a last resort. It is now the custom of one of the authors, Mayo, to administer 100 per cent oxygen immediately after operation to all patients who have undergone an extensive surgical procedure. This routine procedure, in conjunction with transfusion of blood in the most severe cases, unquestionably has been beneficial to these patients. Although it is impossible to say in what percentage of cases such measures have been life saving, there is no doubt that convalescence of the patients so treated has been much more comfortable and satisfactory from the patients' standpoint than otherwise it would have been; this is a surgical objective which should not be neglected.

From a surgical standpoint, therefore, use of 100 per cent oxygen should not be considered to be only an additional measure for treatment of the patient after collapse or shock has developed, but rather it should be thought of and used as a measure that prevents trouble both for the patient and the surgeon.

The authors have found that administration of 100 per cent oxygen, in combination with use of the Wangensteen or Miller-Abbott suction method of intestinal decompression, is more efficient than either method alone. The apparatus for inhalation of oxygen described is particularly convenient for these combined types of therapy, for the mask is provided with a special hole, placed in such relation to the nares that the suction tube can be passed. However, in cases of intestinal obstruction surgical measures should not be delayed too long; it is easy to be lulled

into a false sense of security by the improvement in the patient's condition, including the decrease in the distention, which follows the use of 100 per cent oxygen and suction.

When at the operating table the debatable question arises as to whether a partially obstructed or strangulated segment of bowel should be resected, the decision can be aided by the anesthetist administering for a few minutes 100 per cent oxygen. If the color of the bowel definitely improves, the segment probably will survive, provided administration of 100 per cent oxygen is started immediately after operation. On the other hand, if the color of the bowel does not improve, the segment should be removed.

The distressing gaseous distention which so frequently occurs following even some simple surgical procedure often can be relieved, or at least diminished, by the administration of 100 per cent oxygen. Many patients experience great relief from gas pains, which all too frequently convert an otherwise normal convalescence into a period of agony.

Some types of severe headache, as yet indefinitely determined, with or without nausea and vomiting, can be relieved by the administration of 100 per cent oxygen. The administration of oxygen should be started in a routine manner as soon as the encephalogram has been obtained. As a result, some patients have no headache and very little discomfort; others may have a moderate or severe headache from one to four hours and thereafter only mild discomfort. In nearly all cases there is no further distress after twenty-four hours. The authors have had good results in the treatment of the headache which sometimes follows spinal anesthesia. Certain patients with that combination of headache and nausea which commonly is classified as migraine have been greatly benefited, especially those who suffered from the type of migraine which is associated with prodromal symptoms; if 100 per cent oxygen can be given during the prodromal period, the attack of migraine may be aborted. The alcoholic headache and nausea which occur "the morning after" sometimes can be relieved, especially if administration of oxygen is combined with physical exercise or heat. In a few cases the nausea and vomiting of seasickness have been relieved.

The organisms of gas gangrene and of tetanus are known to be anaerobic. Therefore, the authors point out, in these diseases the prevention of anoxia in the tissues by the inhalation of 100 per cent oxygen, which will increase the oxygen pressure in the tissues between 50 and 100 per cent, is a direct and specific method of combating these diseases. In addition, in cases of gas gangrene the subcutaneous emphysema which results from the presence of hydrogen and nitrogen is rapidly removed; thereby pressure on the capillaries is decreased, and an increase in the rate of the circulation of the blood is permitted, which further elevates the oxygen pressure in the tissues.

The symptoms which accompany acute, massive atelectasis are greatly benefited by the administration of 100 per cent oxygen. This condition is characterized by the sudden onset of severe dyspnea and cyanosis. These manifestations are due to the continued circulation of blood through that part of the lungs from which all, or nearly all, exchange of air is prevented by the presence of a plug of mucus or of some other obstruction to a bronchial tube.

In acute pulmonary edema the inhalation of 100 per cent oxygen is of very great benefit; in some cases, as suggested by Barach, inhalation under slight positive pressure (5 cm. of water) has an additional favorable effect. Pulmonary embolism is another condition in which the dyspnea, distress, anoxemia, and resulting shock in some instances can be dramatically relieved.

Many types of heart disease will respond more favorably to a standard therapeutic procedure if 100 per cent oxygen also is administered. Relief of the pain of angina pectoris sometimes is obtained with striking rapidity.

The apparatus for the inhalation of oxygen which the authors have used was devised by two of them, together with Bulbulian, and is known as the B.L.B. inhalation apparatus. It consists of three parts: the mask, the connecting-regulating device, and the reservoir-rebreathing bag.

The mask. For use in aviation as well as for the treatment of patients over long periods of time, it was essential that the mask be so designed that it would not only be comfortable but also fit perfectly. Two types of interchangeable masks were designed: one, the nasal type, leaves the mouth free for talking, eating, or drinking, which is a decided advantage for prolonged use; the other, the oronasal type, covers both nose and mouth and is for use by individuals who have nasal obstruction or who are mouth breathers.

The connecting-regulating device. A metal connecting and regulating device connects the mask to the reservoir-rebreathing bag. The oxygen inlet tube passes through this metal device, turns downward, and conducts the oxygen into the lower part of the bag. It is provided with a rotating sleeve which is pierced by three small openings or airports which can be brought into registry with similar openings in the main tube by turning the sleeve. When it is desired to administer 100 per cent oxygen, these airports are closed; when it is desired to dilute the oxygen with air, one, two or three of the airports are left open. In addition, there is an expiratory valve provided with a spring under light tension, which permits escape of expired air over and above the amount which is just sufficient to distend the reservoir-rebreathing bag without causing any appreciable resistance to expiration. By adjusting the airports and regulating the flow of oxygen from the oxygen tank, any desired proportion of oxygen and air can be administered.

The reservoir-rebreathing bag. The reservoir-rebreathing bag is of such size that it will contain slightly less than the volume of air contained in one expiration under the conditions in which the appa-

ratus is being used. For practical purposes a bag of a capacity of 500 c.cm. can be used in nearly all instances.

Accessory apparatus. In addition to the apparatus for inhalation of oxygen, a reducing valve and flowmeter are necessary parts of the equipment. Any type of reducing valve and flowmeter manufactured by a reliable concern can be used. The flowmeter should be graduated in liters of flow per minute. A float or kinetic type of flowmeter is preferable to one of a pressure type because the latter is more likely than the former to get out of order and give inaccurate readings, especially for the small rates of flow used in conjunction with this inhalation apparatus. Flowmeters should be doubly calibrated so that they can be used to indicate the rate of flow of pure oxygen or of the mixtures of 80 per cent helium and 20 per cent oxygen that are used for the treatment of asthma; by having the double calibration, all reducing valves and flowmeters can be used interchangeably for straight oxygen therapy or for helium-oxygen therapy. Unfortunately, at present, the large cylinders are equipped with two types of valves which have different threads. Therefore a small "adapter" always should be on hand so that the reducing valve can be attached to either type of cylinder valve.

Each type of mask is made in two sizes: Mask 1 is the nasal mask for men, or for women with large faces; Mask 2 is the nasal mask for women, or for men with small faces; Mask 4 is the oronasal mask for men and Mask 5 is the oronasal mask for women. First the appropriate size and type of mask for an individual is selected by placing different masks on the patient's face. Then the rubber tube that runs from the reducing valve and flowmeter (these are attached to the oxygen tank) is connected to the inlet tube of the connecting-regulating device. The oxygen is turned on so that the flow is about 6 or 8 liters per minute, according to the depth and rate of respiration. Next, the mask is adjusted in place. In most instances it is most comfortably held in place by the rubber-retaining strap's being placed around the back of the head or neck just below the ears; in some instances other positions are better. The length of the strap should be carefully adjusted before it is fastened, so that tension is sufficient only to hold the mask gently against the face. The metal pieces on the mask, which hold the strap in place, can be bent slightly to aid in making the mask fit accurately; it need not be strapped on so tightly that it is uncomfortable even when worn constantly for days. A glance at the reservoir-rebreathing bag will tell whether the apparatus is properly adjusted to prevent a significant leak, because the bag expands nearly to capacity on expiration and contracts on inspiration.

When it is desirable to administer approximately 100 per cent oxygen in the inspired air, all three of the portholes in the connecting-regulating device should be closed by proper rotation of the airport sleeve; the valve on the reducing valve which controls the flow of oxygen should be so adjusted that the flowmeter indicates that from 6 to 8 liters (more if the patient is breathing deeply) are being delivered. After the patient has become accustomed to the apparatus, the rate of flow often can be reduced to 5 or 7 liters per minute. However, at all times when it is desired to give 100 per cent oxygen in the inspired air, the rate of flow should be sufficient that the reservoir-rebreathing bag does not completely collapse on inspiration. If when all the airports are closed the rate of flow of oxygen is not sufficient to prevent the bag from completely collapsing, there will develop a sudden, marked resistance to completion of the inspiratory cycle, which may frighten the patient if it occurs before he is completely accustomed to the apparatus.

When it is desired to administer from 50 to 60 per cent oxygen in the inspired air, that is, to use the concentration of oxygen that commonly is employed in the best run of oxygen tents, then the rate of flow of oxygen from the tank, as measured by the flowmeter, should be 4 liters per minute for a large adult and slightly less for a small individual; the rotating sleeve on the connecting-regulating device of the inhalation apparatus should be so turned that two holes are open. These holes automatically permit the addition of the proper amount of air, when the flow of oxygen is 4 liters per minute to cause the inspired air to contain between 50 and 60 per cent oxygen. When oxygen diluted with air is being administered and the two airports are open, the reservoir-rebreathing bag completely collapses on inspiration and the patient automatically obtains the remaining amount of his inspired air through the open airports.

The authors caution that in adjusting the mask to the face, the nurse should be careful not to have the retaining strap too tight. Tension of the strap should be sufficient only to hold the mask in place and it is sufficiently tight if the reservoir-rebreathing bag is moving up and down regularly with each respiration. Whenever the nurse passes the patient she should glance at the reservoir-rebreathing bag; if it is not moving, only a moment is necessary to adjust the mask properly. To keep the patient comfortable the mask should be removed at intervals of about two hours and the patient's face washed, the skin dried, and talcum powder applied. If the patient is at home, any competent member of the family can be taught in a few minutes just what to do. In fact, when the mask is used in the prodromal stage of certain types of migraine to abort an attack, the patient can be taught in a brief time the entire technique of administering the oxygen to himself at home.

Cost of oxygen therapy. Up to now the high cost of oxygen therapy has acted as a deterrent to its general use early in the course of an illness. To administer oxygen by a tent costs the patient from $12 to $25 a day, without allowance for the special nursing which is usually a necessity. The authors declare that by use of the B.L.B. inhalation appara-

tus the cost of oxygen therapy should average from only $5 to $8 a day, while at the same time the oxygen will be given more efficiently and can be given in higher concentration, and in most cases without reduction in comfort.

The oxygen inhalation apparatus described will greatly decrease the cost of oxygen therapy. Its use will increase the availability to the general public of oxygen therapy and of helium-oxygen therapy, because the apparatus is as suitable for use by the family physician in the patient's home, as it is in large, well equipped hospitals. Furthermore, the scope of oxygen therapy is broadened because the oxygen can be given in any concentration up to pure oxygen, which enlarges the field of treatment to include diseases that are benefited by high concentrations of oxygens, and which do not respond much, if any, to lower concentrations. Inhalation of 100 per cent oxygen does not cause pulmonary irritation if administration is not maintained continuously for more than two days; after two days, lower concentrations should be used.

Guthe, T., and Nygaard, K. K.: Studies on Ascorbic Acid by Means of the Photelgraph. *Acta med. Scand.*, 1939, 101: 40.

In a previous article a new apparatus, the photelgraph, based on the photo-electric principle was described. The apparatus permits automatic recording of varying transillumination values during so-called "progressive processes." Along with the discussion of the principles of photo-electricity, the applicability of this apparatus to photochemical processes was pointed out.

In the present article the principal points in photochemical reactions are briefly discussed in general. Particular attention is drawn to the phenomena of velocity and acceleration in the photochemistry of progressive processes in which redox dyes are employed as indicators of oxidation-reduction processes.

The production and regulation of chemical change by light, with special reference to the reducing effect of ascorbic acid on methylene blue, is discussed. Light of wave-length from 560 to 680 mμ has a similar activating effect on ascorbic acid *in vitro* as ascorbic-acid oxidase has on respiration systems *in vivo*. This range from 560 to 680 mμ coincides with the absorption spectrum of methylene blue.

A new method with the photelgraph for direct estimation of the quantitative yield in photochemical oxidation-reduction of ascorbic-acid methylene blue is described. By continuous recording of the process on electrocardiographic paper the velocity of the reaction is directly accounted for and controlled by the geometrical appearance of the resulting curve, which has been termed "scorbelgram." The time factor (velocity) is dependent on a number of other factors, the chief of which are the quantity and quality of radiant energy, the temperature, the concentration of ascorbic acid, and the indicator. Under standardized conditions the photochemical process between ascorbic-acid light and methylene blue is quantitative also as regards the time factor. Theoretical and practical points in this connection are supported by suitable data.

In the scorbelgrams the degree of reduction is determined by means of the "deviation value," which means the photo-electric difference between partially and completely reduced specimens expressed in millimeters. The minimum value of illumination effecting 100 per cent reduction (deviation value = 0) with a given amount of ascorbic acid, within a chosen, convenient standard time, is termed the "illumination titer" of that particular concentration of ascorbic acid. A constant inverse relationship between different illumination titers and the respective concentration of ascorbic acid has been observed. This observation and the demonstration of an equimolecular reaction between ascorbic acid and methylene blue express the quantitative basis of the method described, which obeys the general laws of photochemistry.

Finally, some factors regarding the velocity and specificity of the reaction are discussed: among others, the influence of pH and of interfering substances. The geometrical appearance of the scorbelgram indicates to a certain extent the relative specificity of the reducing substance.

Some kinetic points regarding the quantitative applicability and photochemistry of oxidation-reduction processes have been treated somewhat in detail. This was found necessary in order that a proper basis for quantitative studies in body fluids be obtained; these studies are to be published subsequently.

Hanke, H.: Hormones and Surgery (Hormone und Chirurgie). *Deutsche med. Wchnschr.*, 1938, 2: 1617, 1653.

There are many misconceptions concerning the action of hormones. Hormones do not come solely from glandular organs, as, for example, the posterior lobe of the pituitary gland and the adrenal medulla. The essential point is that these substances act far from their source of origin. Wound hormones cannot be accepted as such; besides they are as yet hypothetical. Furthermore, genuine hormones have not as yet been demonstrated in the blood. The internal secretory system is not a self sufficient and enclosed system. It is intimately associated with the sympathetic nervous apparatus. It is not accurate to state that certain hormones always act synergistically or antagonistically to each other as, for example, increased function of the thyroid gland acts antagonistically to the pancreatic islands of Langerhans. The total removal of the thyroid gland should therefore be effective in the treatment of diabetes; however, this is not true in the non-hyperthyroid diabetic patient.

With the diminution or exclusion of normal thyroid function we are in an absolutely new surgical field, which presents many problems. Organic heart

disease in the hyperthyroid patient may be favorably influenced by thyroid resection. However, Americans have recommended that subtotal or total thyroidectomy be done for severe organic heart disease in the presence of a normal thyroid. Following the latter improvement was observed in 70 per cent of the cases, and a very low mortality. The last word has not yet been said concerning the end-results. Compensation for deficient thyroid function is now assured by the administration of various standardized thyroid preparations (thyroxin, elityran). The quantities to be administered vary with the individual needs. Absolute indications are myxedema and ablation of the thyroid gland. There are also certain relative indications for thyroid therapy depending on circumstances. Breitner treats endemic goiter with small doses of thyroidin for a half year beginning with three weeks of age. Care is necessary to avoid thyroxin-induced Basedow's disease. However, the attempts to increase the normal thyroid function are uncertain. The author discusses Rehn's teaching that there is a danger from operative work on the thyroid in that the sympathetic system may be inhibited, and also mentions the activating effect of the anterior hypophysis on the thyroid gland. At the Freiburg Clinic in 4 instances before operation, 200 units of the thyreotropic anterior pituitary lobe were given from one to two days, together with "vogan," under the control of basal-metabolism determinations; the increase in the circulating blood occurred parallel with the increase in the basal metabolism. Apparently this treatment also acts favorably on postoperative pulmonary complications and emboli. The question comes up whether the thyroid hormones also have a favorable influence on regenerative processes in wound healing and callus formation as has been shown with vitamins. Certainly they affect the general metabolism in wound healing; but the answer to this question is difficult because there are so many factors in the process of wound healing. Of practical significance is the effect on bone-callus formation. It is known that in the hyperthyroid individual callus formation is not harmed (Caegesser). Hanke's own experiments on animals indicated that the administration of elityran accelerated healing. Although Vitamin C is indispensable, preparations from the thyroid and the anterior lobe of the pituitary gland act only as supplementary aids.

The relation of the adrenal glands to generalized fibrous osteodystrophia must still be elucidated, since tumors of the gland are not always associated with hypercalcemia. The author's own observations indicate that the adrenal changes are secondary rather than primary. Frequently the surgeon finds in such cases atypical changes in the thyroid or thymus glands. Furthermore, there is no real knowledge as yet concerning the relation to localized osteodystrophia, Paget's disease, myositis, sclerodermia, and chronic polyarthritis. Surgery has made many errors. More accurate is our knowledge in the treatment of the tetanies. In acute tetanic spasms parahormone works immediately; while A. T. 10 (Holtz) is better for prolonged action. The latter is given by mouth in small doses and under control with serum-calcium determinations. With this treatment the implantation of parathyroid bodies is rendered unnecessary.

The hormone of the thymus apparently plays a rôle in severe pseudoparalytic myasthenia, in which condition tumors have been found (Adler). Also it seems to be related to the thyroid gland in certain fatal cases (Klose and von Halverer). Preoperative radiation is to be considered. One hears little nowadays of the formerly very common status thymolymphaticus.

With regard to the pancreas the author mentions hyperinsulinism, that is, a spontaneous hypoglycemia with manifestations of insulin shock due to adenoma of the islands of Langerhans and cured by their surgical removal.

Former correlations with epilepsy have proved erroneous. Adrenal cortical tumors which cause premature sexuality, and adrenal medullary tumors which cause paroxysmal hypertension are amenable to surgery. Nevertheless, surgery in ordinary hypertension is to be avoided unless there is a demonstrable hyperadrenalemia. This also holds true for juvenile gangrene and Raynaud's disease except when increased adrenal secretion is observed. Experience with Addison's disease has proved unfavorable. The favorable results from adrenalin administration in circulatory collapse are noted. We have still very little experience with adrenal cortical hormone, which may act favorably in burns, infections, and toxemias, because pathologico-anatomical changes are found in the organs.

Although we are well informed as to the physiology of the pituitary gland, from a practical therapeutic standpoint we are not very successful in our treatment of acromegaly, Simmonds' disease, and basophilic changes of the pituitary gland. The surgeon, however, will treat the tumors. The anterior-pituitary-lobe preparations, preloban and prephyson, are very uncertain. Attention is called to Sauerbruch's transplantation of the pituitary gland in Simmonds' disease. Furthermore, the effectiveness of the posterior pituitary lobe is pointed out in postoperative intestinal atony, cholelithiasis, renal stones, and failure of the peripheral circulation (Tonephin).

In cryptorchidism correction may be obtained after the age of six years by the use of testicular hormone combined with prolan; if this fails, surgery is indicated. The action in early prostatic hypertrophy is doubtful. For aid in the diagnosis of teratoma and chorio-epithelioma the excretion of gonadotropic hormones in the urine may be utilized. In recent times it has been attempted to demonstrate the influence of ovarian hormones on mammary cancer and chronic cystic mastitis. According to Sauerbruch and Knape there is a correlation between gonadal endocrine secretions and the growth of malignant tumors.

In conclusion, the author discusses padutin (Frey), which is considered to be a hormone, and its vasodilator action in Raynaud's disease, and other vasospastic conditions. (Franz). Jacob E. Klein, M.D.

DUCTLESS GLANDS

Marañon, G.: The Pathogenesis of Cushing's Syndrome (Sur la pathogénie du syndrome de Cushing). *Ann. d'endocrinol.*, 1939, 1: 241.

Marañon reports 2 cases which showed the typical Cushing syndrome clinically, but autopsy showed the anterior portion of the pituitary gland to be entirely normal and the adrenals hyperplastic. The first of these cases was reported by the author in 1926, i.e., before Cushing had described the syndrome that bears his name; the second case was seen more recently and has not been fully reported previously. In the first case, the author states that he made a definite error in diagnosis, which a later review of the case and the pathological findings enabled him to correct. Because of a slight head injury a diagnosis of the adiposogenital syndrome due to pituitary hemorrhage following trauma was made during the patient's life; the finding of a hemorrhage of the pituitary gland involving the median and posterior lobe was considered as a confirmation of this diagnosis. Following the publication of Cushing's article, a study of the history of the case showed that the adiposity was of the Cushing type, involving the upper part of the trunk rather than the lower part, and that there was marked plethora and cyanosis, also characteristic of Cushing's syndrome, but not of the adiposogenital syndrome. As the pituitary gland had been preserved in this case, a special study of the anterior lobe and the basophile cells was made, and they were found to be entirely normal. The pathological report showed that both adrenals were enlarged and showed adenomatous hyperplasia, involving both the medulla and the cortex.

In the second case, the adiposity was of the Cushing type and involved the upper half of the trunk; it was associated with plethora, cyanosis, bluish striæ on the abdomen, an increased red-cell count, and somnolence. At autopsy a careful study of the pituitary gland showed it to be normal; there was no basophile adenoma and not even the slightest hyperplasia of the basophile cells. Both adrenal glands were enlarged and showed a marked hyperplasia involving the cortex chiefly.

Some cases of Cushing's syndrome have been reported in which no mention of the condition of the adrenals was made, or it was stated that they were normal, but no histological examination was made. In 1 of the cases, the author notes, it was stated that the adrenals weighed 20 gm. each, which certainly indicates a hyperplasia of some type. On the other hand, a number of cases of typical Cushing's syndrome have been reported by others in which there was adrenal hyperplasia without any changes in the basophile cells of the pituitary gland; and other evidences of adrenal hyperfunction have been found in such cases. In 3 cases of typical Cushing's syndrome observed by the author, including the second case reported, there was a definite increase of sodium and a normal or reduced content of potassium in the blood,—a "metabolic formula" characteristic of adrenal hyperfunction and the opposite of that observed in adrenal insufficiency. The characteristic symptoms of the syndrome can all be explained as being due to adrenal hyperfunction; whether the blood pressure is increased or not depends upon whether the medulla is involved in the adrenal hyperplasia.

It may be that in some cases of Cushing's syndrome, the pituitary basophilism is primary and the adrenal hyperplasia secondary. However, even in such cases it is the adrenal hyperplasia and hyperfunction that is responsible for the clinical syndrome. The pituitary basophilism, on the other hand, may be secondary to the adrenal changes; signs of the involvement of other ductless glands are evident in some cases of the syndrome, and the involvement of the pituitary gland might be of the same secondary type and no more important than the involvement of the other endocrine glands. Alice M. Meyers.

Magoun, H. W., Fisher, C., and Ranson, S. W.: The Neurohypophysis and Water Exchange in the Monkey. *Endocrinology*, 1939, 25: 161.

Fisher, Ingram, and Ranson have previously indicated that the elaboration of an antidiuretic hormone by the neurohypophysis is dependent upon the innervation of the gland via the infundibulum by a large tract of nerve fibers with their most important component arising from the supra-optic nuclei of the hypothalamus. In both the cat and monkey hypothalamic lesions so placed as to interrupt the supra-optico-hypophyseal tract were followed by retrograde degeneration of the supra-optic nuclei and neurohypophysis, together with the loss of secretory activity and development of marked polyuria and polydipsia characteristic of diabetes insipidus.

The authors of this article believe that the failure of many investigators to produce experimental diabetes insipidus by stalk section or attempted extirpation of the neurohypophysis has been in large part due to their failure to make the line of incision high enough, the median eminence being left intact.

Because of the emphasis placed on such an apparently minute structure as the median eminence, an attempt was made to determine what proportion in terms of volume it forms of the total normal hypophysis. In addition, the volumes of the degenerated parts of the neurohypophysis distal to the line of transection, and volumes of the portions of the gland proximal to this line were determined in the operated animals. These measurements were then correlated with the presence, absence, and degree of polyuria shown by the different animals. A series of monkeys were subjected to subtemporal

section of the infundibular stalk under deep nembutal anesthesia and observed for periods up to twelve weeks after operation. In the different animals marked permanent polyuria, mild permanent polyuria, brief secondary polyuria, or normal urine outputs were observed.

A study of serial sections of the hypophysis and overlying hypothalamus prepared in every case showed that the animals with marked polyuria had complete transections of the median eminence or section of its anterior half alone; while the animals with the less severe symptoms or with normal urine outputs had sections of the infundibular stem below the median eminence or through the posterior half of the median eminence. Volumetric determinations showed that in the cases with marked polyuria an average of from only 5 to 7 per cent of the total volume of the normal neurohypophysis remained proximal to the section and connected with the hypothalamus. In the cases with normal urine outputs, an average of from 12 to 16 per cent of the total volume of the neurohypophysis remained connected with the hypothalamus proximal to the section. Transection of the median eminence or of the infundibular stem regularly caused marked atrophy of the infundibular process.

With preservation of from one-sixth to one-eighth of the neurohypophysis, normal urine output was maintained. This demonstrates a wide margin of physiological reserve, which is comparable to the reserve possessed by various organs of the body, including the endocrine glands.

The negative results encountered by other investigators following low-stalk sections in the monkey are to be explained by the sizable amount of neurohypophysis left proximal to the section, which was connected with the hypothalamus and innervated by the supra-optic nuclei.

SAMUEL B. SPIRA, M.D.

Aschheim, S., Portes, L., and Mayer, M.: Pituitary Gonadotropic Hormone Therapy (L'hormonothérapie hypophysaire gonadotrope). *Ann. d'endocrinol.*, 1939, 1: 164.

Any hyperfunction or hypofunction of the genital tract may be the object of treatment with gonadotropic hormones. The genital syndromes in which such treatment would appear justifiable include: those conditions which seem to indicate a deficient gonadotropic pituitary function, such as pituitary cachexia; primary and secondary amenorrhea; those conditions which result from a sudden spontaneous or artificial suppression of the menses (castration or the menopause); conditions manifested by metrorrhagia; and, finally, conditions due to abnormal ovarian formations. The conditions amenable to hormone therapy include only those due to pituitary insufficiency.

In pituitary cachexia, treatment with total pituitary preparations rather than with the gonadotropic factor alone seems indicated. Improvement in the general condition and even restoration of the menstrual cycle might be expected from implantation of pituitary glands from newborn infants or animals, or from extracts of the anterior lobe of the hypophysis.

There are also cases in which malnutrition is the responsible factor and in which hyperalimentation or the administration of the needed vitamins would have to be considered rather than hormone therapy.

Treatment of primary amenorrhea bears hope of success only in women who have normal even if hypoplastic sex organs. If it can be demonstrated that the amenorrhea is related to deficient pituitary function and that the woman to be treated possesses a uterus and ovaries, one may be justified in attempting hormone treatment, either with estrogenic or gonadotropic substances.

Estrogenic substances act directly upon the uterus itself. In some cases even enormous doses of estrogenic hormone have no effect. Moreover, we have no proof that the administration of such large doses of hormone over long periods of time may not be harmful. Experimentally, such a procedure may lead to angiomatous transformation of the pituitary gland and suppression of the gonadotropic function. By limiting the dose to 25 mgm. per month this danger may be avoided. The initial treatment with estrogenic substances may, moreover, indicate whether the uterus is capable of reacting functionally. If not, it would be futile to apply gonadotropic therapy. If the estrogenic substances have no effect on the uterus and do not restore menstruation, it is probable that there is little hope of producing an estrogenic effect with the use of gonadotropic hormones.

Unfortunately, the positive results obtained in animal experiments by the successive administration of folliculin-stimulating and luteinizing hormones for production of the genital cycle are not paralleled by equal results in human subjects. We have first to determine which hormones are to be used, then the proper dose; moreover, we are uncertain as to whether the treatment may not involve some risk to the patient. The gonadotropic hormones cannot be administered orally because they are practically destroyed by the diastase in the stomach and intestine.

Implantation of fresh calf pituitary substance, as successfully performed in 1 case of primary amenorrhea by Ehrhardt, can hardly be considered for practical purposes. The urine and even the blood of pregnant women have been used for their gonadotropic effect. Some successes have been reported but also many failures. In some cases gonadotropic and thyroid hormone therapy have been combined, as in certain patients suffering from amenorrhea with obesity. Also prolan has been combined with the estrogenic hormones. In such cases the therapeutic effect cannot be attributed exclusively to the pituitary gland.

As regards dosage, there is little uniformity of opinion. The normal woman eliminates about 750 mouse units of gonadotropic hormone during a

menstrual cycle. As the quantity excreted is believed to be less than that secreted by the pituitary gland, an average of 2,000 mouse units may be administered per month for about three months, or 100 units daily for twenty days. Whatever preparation is used, it is most important that the reaction of the organism be very carefully controlled. If after the first injections there can be demonstrated an increase in the size of the uterus and increased elimination of estrogenic substances in the urine, one is justified in continuing the treatment and repeating it for several months, even though the menses have not appeared. If, on the other hand, a painful hypertrophy of the ovaries occurs with the formation of follicular or lutein cysts, treatment should be discontinued.

Secondary amenorrhea responds more favorably to hormone therapy. Before hormone therapy is attempted, it is necessary to exclude tuberculosis, anemia, malnutrition, and genital lesions as the cause of the secondary amenorrhea. In secondary amenorrhea in which a pituitary origin can be demonstrated, the procedure should be the same as in primary amenorrhea, namely, estrogenic hormone therapy should be used first and eventually gonadotropic hormone therapy may be tried. The same procedure is applicable to menopausal amenorrhea. It must be kept in mind that the menopause involves not only cessation of the menses, but also other factors, upon which the gonadotropic hormones have no effect. It would seem preferable to employ the estrogenic hormones in these cases.

In sterility due to deficient ovulation, gonadotropic therapy seems justifiable. Biological tests will be required to demonstrate that the menstrual cycles occur without ovulation. Luteinizing hormone may be administered to produce ovulation. However, the failure of the secretory uterine phase may be attributable to other factors as well, and there may be a question of stimulating the cycle in general rather than luteinization *per se*. As a matter of fact, it is very difficult to obtain this effect in women because there are no pure hormonal products on the market containing follicle-stimulating or luteinizing principles exclusively. Prolan loses its luteinizing effect if the organism has received preliminary treatment with a follicle-stimulating preparation. The establishment of an artificial cycle in human subjects is therefore as yet impracticable.

The hemostatic effect of gonadotropic substances in hemorrhagic conditions, such as the menorrhagias of fibroma or hemorrhagic metropathy, suggests that these hormones intervene by way of the ovary. The hemostatic effect of certain gonadotropic substances might be due to the production of a corpus luteum having all the properties of the pregnancy corpus luteum which is capable of producing progesterone. However that may be, the use of gonadotropic hormones in the treatment of uterine hemorrhage is recommended. During the second part of the intermenstrual cycle (for instance ten days after cessation of the hemorrhage) a dose of 1,000 rat units should be injected every day over a period of from ten to fifteen days.

The use of gonadotropic hormones in the treatment of inflammatory conditions of the internal genital organs appears to the authors not devoid of danger, because in cases of acute inflammation the hyperemia produced might lead to the formation of ovarian abscesses, and in cases of subacute or chronic types of inflammation physiotherapy is preferable because the degree of hyperemia can be regulated at will.

In disorders of the menopause hormone therapy might yield good results if the physiological phenomenon could be influenced by inhibition of the pituitary gland by the administration of folliculin in large doses and even lutein hormones; however, in the functional disorders symptomatic treatment should not be neglected. The latter consists chiefly in the administration of sedatives and anti-spasmodics.

In some cases of ovarian cyst there is an excessive elimination and secretion of gonadotropic hormones which may lead to errors in diagnosis. Extrauterine pregnancy may be suggested, and a futile operation may be done. As to the prospects of successful hormone therapy of cysts of the ovary, it must be kept in mind that neither folliculin nor lutein would have any certain or rapid effect on the size of the ovaries. It is only when the cysts are associated with functional symptoms, such as amenorrhea or menorrhagia, that gonadotropic hormone therapy is indicated. The failure of hormone therapy in genital diseases accompanied by an excessive elimination of hormones may be due to the fact that the cause of the syndrome lies in a lesion of the hypophysis. It is difficult to understand why women with excessive gonadotropic hormones and ovaries capable of reaction should be amenorrheic. The problem is very complex and there are probably unknown factors involved.

The various pathological conditions of pregnancy associated with an excess of gonadotropic hormones are discussed. In normal pregnant women the gonadotropic hormone in the urine averages 20,000 mouse units. In hydatidiform mole the number of mouse units of gonadotropic hormone per liter of urine may increase to from 250,000 to 500,000 mouse units or more. The ovaries of women with hydatidiform mole are often hypertrophied and deformed by a polycystic transformation. The same condition is found in women suffering from chorio-epithelioma. It is possible that not only prolan but the pituitary gland takes part in the production of these polycystic formations. Women suffering from hyperemesis of pregnancy or from eclampsia frequently present an excess of gonadotropic hormones in the blood and urine, but so far cases of associated polycystic ovary have not been described. The explanation of these phenomena is still impossible. Caution should, however, be exercised in the combined administration of prolan and pituitary hormones.

EDITH SCHANCHE MOORE.

Leroux, R., Marañon, G., Richet, C., and Pergola, A.: Tetany in the Adult and Persistence of the Thymus (Tétanie de l'adulte et persistance du thymus). *Ann. d'endocrinol.*, 1939, 1: 152.

The authors have recently emphasized the importance of folliculin in the etiology of certain tetanic conditions. In the present article they draw attention to the rôle played by the persistent thymus in certain cases of tetany. A case of tetanic convulsions in a woman twenty-one years of age is described in detail. She died of meningeal hemorrhage. At autopsy the conditions found were subacute parathyroiditis and persistence of the thymus, which presented the size and structure of an infantile thymus.

A large number of cases appearing in the literature indicate a relationship between persistent thymus and tetany. In animals extirpation of the thymus produces profound changes in the mineral metabolism. Active thymus extracts have a hypocalcemic effect and may under certain conditions neutralize the hypercalcemic effect of parathyroid extracts. The larvæ of certain amphibia fed on thymus extracts occasionally develop tetanic symptoms analogous to those produced by parathyroidectomy. If the thymus is removed some days prior to parathyroidectomy tetany will not develop. Extirpation of the thymus produces, so to speak, an anti-tetanic state with deep apathy and a tendency toward immobility and idiocy. Parhon and Marinesco obtained good results from thymus therapy in a case of hyperparathyroid osteosis. In cases of infantile tetany hypertrophic changes of the thymus have been demonstrated in addition to the hypoparathyroid lesions. The great majority of cases of tetany occur in infancy, i.e., in the thymic age, and subside spontaneously as the thymus atrophies. Pende believes that patients who were reported as having succumbed suddenly to hypoparathyroidism were suffering from hypothyroidism associated with hypertrophy of the thymus. The thymus and the inferior parathyroid glands are of the same embryological origin. All these facts indicate that an antagonism exists between parathyroid and thymic function which renders most probable the intervention of a hyperthymic factor in certain types of tetany. Klose and Vogt are likewise of this opinion. The case described would support such a theory.

The possible relation of other endocrine factors to tetany has been less widely discussed. Some years ago there was much talk of an antagonism between or a parallelism of parathyroid and thyroid hormones. No experimental evidence has been offered to support the theory of a thyroid factor in tetany; moreover, clinical facts would seem to contraindicate such a relationship. Nor have any definite indications of a relation between the pituitary gland and tetany been demonstrated. Pende believes that an intimate relationship exists between parathyroid and suprarenal function, which would explain certain cases of tetany associated with suprarenal insufficiency.

The authors conclude that from an endocrinological viewpoint one can hardly be satisfied that tetany indicates exclusively a parathyroid insufficiency, even though the latter plays the determining rôle in hypocalcemic tetany. Pende has described cases of tetany of pluriglandular origin. This seems also the character of the present case. Just as several endocrine glands are involved in sugar metabolism, several glands may be involved in the regulation of calcium metabolism, so that one may speak of ovarian tetany, thymic tetany, or pluriglandular tetany. In tetany, as in diabetes, one may have to consider a central nervous factor. For a long time indeed, tetany was considered a disease of the nervous system. Sometimes the tetanic syndrome bears a remarkable resemblance to that of epilepsy and there are no doubt cases of true epilepsy associated with tetany, and forms of tetany which cannot be differentiated from epilepsy. Hysteria was long considered as responsible for tetanic symptoms. Curschmann has described forms of transition from hysteria to tetany.

At autopsy of a case of tetany in an adult the findings included congestion and punctiform hemorrhages of the meninges and nerve substance itself. In the present case the lesions were those of congestion and diffuse hemorrhages with a central hemorrhagic focus not described in any other case.

The circulatory lesions may be interpreted as being related to the nervous factor, presupposing the existence of tetanic vascular spasms. In some cases there may develop a veritable visceral vasomotor tetany localized here or there and capable, of course, of involving the cerebral vascular system. In other cases of tetany severe disturbances of the peripheral circulation have been described, and there is no reason for the assumption that such lesions could not affect the brain as well, with a consequent encephalomeningeal syndrome followed possibly by death (as in the present case).

There remains another factor to be considered, namely, the alimentary factor. It is well known that a Vitamin-D deficiency will cause tetanic symptoms. Epidemics of tetany have occurred in regions where for some reason or other the supply of this vitamin was cut short. In the sunny countries of Southern Europe tetany is rare. Tetany is most frequent toward the end of winter and spring when food is most deficient in Vitamin D. For this reason, the treatment of tetany with ergosterin (irradiated) and ultraviolet irradiation has been very successful. The rays transform the ergosterin into Vitamin D.

The diagnosis of visceral tetany depends upon the demonstration of the following factors: (1) the existence of other phenomena of contraction or convulsion of the muscles; (2) the existence of trophic phenomena of the hypoparathyroid type, such as changes in the enamel of the teeth, in the nails, and in the hair, and cataract; (3) in the absence of these symptoms of tetany, there must be signs of latent tetany such as irritability, non-stable character, and excessive neuromuscular excitability (signs of

Chvostek and Trousseau), or, in women, signs of hyperfolliculinism; (4) the appearance of hypocalcemia and hypophosphatemia during the suspected visceral attacks (the absence of these symptoms would not justify refutation of a diagnosis of tetany, however); and (5) the disappearance or subsidence of symptoms following the administration of parathyroid preparations. If, at most, 3 of these criteria are wanting it would be unwise to attribute a visceral syndrome to tetany.

EDITH SCHANCHE MOORE.

Leriche, R., and Jung, A.: The Surgical Treatment of Diabetes by Diversion of the Bile Stream. Experimental and Clinical Studies (Essai sur le traitement chirurgical du diabète par la dérivation biliaire. Documents expérimentaux et cliniques). *Ann. d'endocrinol.*, 1939, 1: 3.

Previously the authors observed stimulation of the islands of Langerhans in experimental studies on diversion of the biliary stream. These results were so stimulating that the studies have been continued both experimentally and clinically.

Experimental studies were made on 17 dogs in which the common bile duct was sectioned, the lower end ligated, and the upper end cannulized. The dogs died or were killed at intervals varying from six days to four months. Detailed histological studies of the pancreas and blood-sugar tests were made. The most striking microscopic changes were the constant finding of enlarged and vascularized islands of Langerhans. In some of the animals there was noted also perilobular sclerosis of the pancreas with degeneration and necrosis of some of the parenchymal cells of the pancreas. The blood-sugar studies indicated marked diminution after the biliary diversion, in some instances to half of normal values.

One very interesting clinical experience is described in great detail. This concerned a thirty-one-year-old woman who had diabetes for two years before presenting herself at the clinic. In the past she had had mild gastro-intestinal disturbances. On appearance at the clinic she had polydipsia, polyuria, glycosuria, and hyperglycemia. On abdominal palpation she displayed a mild hypersensitivity over the pancreatic region; the gall-bladder area was not painful. She received 100 units of insulin daily.

Under general anesthesia a cholecystotomy was done. The gall bladder was normal and the bile was clear. Her convalescence was uneventful. About 300 c. cm. of bile were drained daily; the stools retained their normal color. The patient received 80 units of insulin the day after the surgical intervention; after that no insulin was given. Ten days after surgical intervention the blood sugar was normal and there was no glycosuria. The patient returned home, was kept under observation and remained normal for thirteen months. However, upon removal of the biliary drain she had a relapse accompanied by marked hypertension. For the latter condition Leriche performed a left adrenalectomy with section of the splanchnic nerves and removal of the first lumbar ganglion. The hypertension was relieved. The patient received no more insulin and returned home, where she is still under observation, with hyperglycemia.

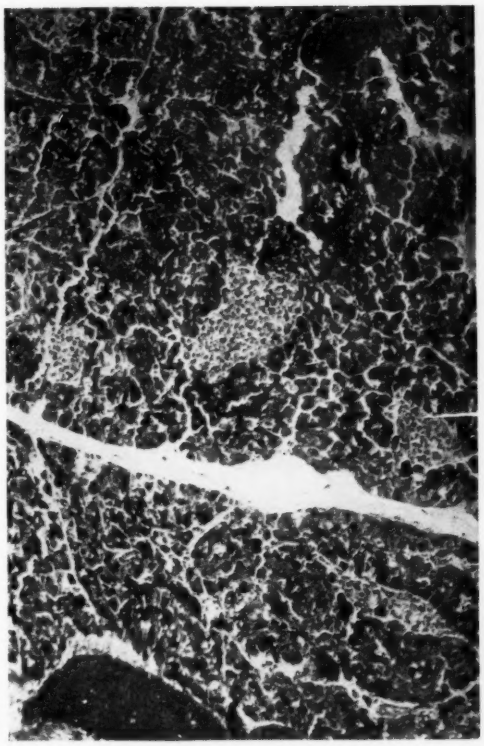

Fig. 1. Pancreas of dog seven days after diversion of biliary stream.

The case may be summarized as follows: a young woman with a severe diabetes which did not respond well to the usual dietetic régime combined with insulin was treated by cholecystotomy of her normal gall bladder. There was a marked improvement in the sugar metabolism with disappearance of the glycosuria, and a fall to normal of the blood sugar. After thirteen months, when the condition was thought to be permanently controlled, the biliary drain was removed with recurrence of the original clinical condition three months after removal of the drain.

The authors do not wish to draw any widespread conclusions from this experience, but point out that activation of the endocrine apparatus of the pancreas is possible by diversion of the biliary stream. They point out the following facts:

1. In animals biliary diversion induces histological changes in the pancreas characterized by exag-

gerated activity of the endocrine elements associated with hypofunction of the rest of the gland.

2. In such animals the blood sugar is habitually low.

3. Induced glycemia in such animals is much lower than in control animals.

4. In the clinical case cited, during the thirteen months of biliary diversion the glycemia ranged from 1.67 to 1.95 without the need of insulin to maintain the equilibrium, whereas before the intervention the glycemia was 3 gm. in spite of the administration of from 80 to 100 units of insulin per day. The authors are at present contemplating experimental and clinical studies on a permanent cholecystojejunostomy. JACOB E. KLEIN, M.D.

EXPERIMENTAL SURGERY

Divella, D.: Hemostasis of Parenchymatous Organs. Experimental Research. (Emostasi degli organi parenchimatosi. Ricerche sperimentali). *Riv. di chir.*, 1939, 5: 251.

Hemostasis of the parenchymatous organs has always been a serious problem for the surgeon, and various mechanical, physical, chemical, and biological methods have been proposed. A review of the literature permits the statement that, generally speaking, the problem has been solved; but the various investigators are at variance concerning the tolerance exhibited by the treated organs toward the materials used for hemostasis, and consequently the subject is still in the experimental stage. The good results obtained by the use of catgut soaked in human milk, which contains a considerable amount of cephaline that is active in causing blood coagulation, induced Divella to experiment with egg yolk, which is richer in cephaline than human milk.

Hen's eggs were boiled to obtain solidification and sterilization of the material to be used and the yolks were reduced to a fine paste. Dogs were employed for the experiments and their hepatic and renal functions were tested two days before and forty hours after the intervention, and then at various intervals until they were sacrificed. The spleen was exteriorized and a deep incision was made in it transversally or longitudinally so that the organ could be opened like a book. The wound was immediately covered with a layer of yolk paste, and slight pressure was exercised with two fingers to make the layer adhere; when complete hemostasis had taken place, the organ was put back in its normal site. Then a lobe of the liver was exteriorized and either a deep incision to within a few millimeters of its lower aspect was made, a wedge-like portion was excised, or part of the upper aspect of the lobe was sliced off; the wounds were treated like those of the spleen. In the case of the kidney, the organ was incised in its entire length down to the pelvis, a wedge of yolk paste was introduced into the wound, and a strip of paste was applied externally to the line of incision. The animals were killed at intervals varying from forty hours to forty-three days after the intervention.

The hepatic function was regularly altered about forty-eight hours after the operation, but returned to normal within a few days. The renal function was not disturbed except for a short time after the intervention. In all cases, hemostasis was prompt and permanent, the hemorrhage lasting from ten to fifty-five seconds, and depending upon the individual case. The yolk paste was absorbed in from twenty to twenty-five days, caused no signs of intoxication, and was replaced by a connective tissue rich in fibroblasts. RICHARD KEMEL, M.D.